



Bringing students to their profession and the profession to students through Competency Standards.

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Submitted in fulfilment of the

requirements for the degree of

Doctor of Philosophy

Faculty of Health

The University of Tasmania

Australia

June 2016

Statements

Declaration of Originality

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The research associated with this thesis abides by the International and Australian codes on human research and was approved by the Tasmanian Social Sciences Human Research Ethics Committee (reference number: H0013591).

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Paper 1. Nash, R., Chalmers, L., Brown, N., Jackson, S., & Peterson, G. (2015). An international review of program wide use of competency standards in pharmacy education. Pharmacy Education Journal 15(1), 131-141.

Located in Chapter 2

Status: Published June 2015 in Pharmacy Education Journal (UK) 2015, 15(1), 131-141.

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Paper 2. Nash, R., Chalmers, L., Stupans, I., & Brown, N. (2016). Knowledge, use and perceived relevance of a profession's Competency Standards; Implications for Pharmacy Education. [Early View 21/04/2016]. International Journal of Pharmacy Practice. DOI:10.1111/ijpp.12267

Located in Chapter 3

Status: Accepted 23/3/2015, Early View 21/04/2016.

Candidate was the primary author and contributed concept design, data collection, analysis, writing and 80% of contribution.

Author 1 contributed concept design, review and 8% of contribution.

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Paper 3. Nash, R., Chalmers, L., Stupans, I., & Brown, N. (2015). A reciprocal relationship: informing a profession's competency standards. Paper presented at Higher Education Research and Development Society of Australasia (HERDSA), Melbourne, Australia.

Located in Chapter 4

Status: Published on 10/08/2015; blinded peer review full conference paper for HERDSA.

Candidate was the primary author and contributed concept design, data collection, analysis, writing and 80% of contribution.

Author 1 contributed concept design, analysis, review and 10% of contribution.

Author 3 contributed concept design, analysis, review and 8% of contribution.

Author 2 contributed concept design, review and 2% of contribution.

Paper 4. Nash, R., Chalmers, L., Stupans, I., & Brown, N. (2015). Sustainable? Traffic Light Report combines competency standards and self-assessment for student's life-long learning. In F. Padro, K. Trimmer, D. Thorpe & T. Newman (Eds.), Higher Education in the Professions: Case Study Illustrations of Quality Practice (Vol. 1). Toowoomba: University of Southern Queensland. [IN PRESS: 30/06/2016]

Located in Chapter 5

Status: Editors accepted contract with Springer 16/12/2015 – Book Chapter Review 1: 22/12/2015, Review 2: 16/5/2016, Final changes submitted to editors (30/06/2016).

Candidate was the primary author and contributed concept design, data collection, analysis, writing and 80% of contribution.

Author 1 contributed concept design, analysis, review and 10% of contribution.

Author 3 contributed concept design, analysis, review and 5% of contribution.

Author 2 contributed concept design, review and 5% of contribution.

Paper 5. Nash, R., Stupans, I., Chalmers, L., Brown, N. Content knowledge has a use-by date, self-assessment skills last a life-time. Target: Journal of Teaching and Learning for Graduate Employability [IN REVIEW: 30/06/2016]

Located in Chapter 5

Status: submitted to Assessment & Evaluation in Higher Education for peer review on 21/3/2016. In preparation for Journal of Teaching and Learning for Graduate Employability.

Candidate was the primary author and contributed concept design, data collection, analysis, writing and 85% of contribution.

Author 3 contributed concept design, analysis, review and 8% of contribution.

Author 1 contributed concept design, analysis, review and 5% of contribution.

Author 2 contributed concept design, review and 2% of contribution.

Paper 6. Nash, R., Stupans, I., Chalmers, L., Brown, N. Traffic Light Report provides a new technique for Assurance of Learning. Journal of Learning Design, 9(1), 37-54. doi: <http://dx.doi.org/10.5204/jld.v9i1.264>

Located in Chapter 5

Status: Accepted by Journal of Learning Design on 03/04/2016.

Candidate was the primary author and contributed concept design, data collection, analysis, writing and 80% of contribution.

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Abstract

New medicines come to market daily and health services continually evolve, consequently knowledge in the health disciplines acquired at university quickly outdates. The public demands that health practitioners maintain their competence to practice. Amongst other purposes, a profession's competency standards are an essential guide for an individual practitioner's life-long learning.

The purpose of this research was to explore whether the National Competency Standards Framework for Pharmacists in Australia (NCS) informed pharmacy education and then to trial an approach in one Australian pharmacy program which directed students specifically to the competency standards. The research aimed to determine familiarity with the NCS amongst the profession, educators and students; to compare how competency standards inform curriculum design in Australia with how they are used internationally; and to establish the current barriers and enablers to the use of NCS in pharmacy education in Australia. These findings inspired the design of an educational intervention entitled the 'Traffic Light Report', trialled at one Australian university with undergraduate pharmacy students. The Traffic Light Report (TLR) was designed to *'bring students to their profession and the profession to students through Competency Standards.'*

A pragmatist frame, educational design and participatory action research philosophies informed the mixed methods research approach. A literature review, surveys, interviews and an educational intervention generated data from participant pharmacists, educators and students and the findings are outlined in six separate but interrelated publications. Each publication's findings contribute essential components to resolve the research question; *"What is the impact on students of an educational intervention (Traffic Light Report) which*

uses self-assessment skills to highlight National Competency Standards for Pharmacists in Australia (NCS) in an Australian pharmacy program?”

The thesis begins with an introduction to the pharmacy profession, outlining the essential commitment pharmacists make to life-long learning and the role of the NCS in this process. It highlights the significant role pharmacy education can play to better equip future practitioners for this commitment to ensure the provision of safe healthcare to the public. It then provides findings from a review of the international literature. The review revealed limited published literature on the use of NCS amongst Australian pharmacy educators, despite descriptions of course-wide use elsewhere in the world. The review findings informed the questions included in the subsequent online surveys and the question guide for semi-structured interviews with Australian pharmacy educators. In addition, the course-wide exemplars described in the international literature informed the design of the TLR. These exemplars included;

- The Triple Jump Examination; an annual competency based programme level assessment using three different forms of assessment (open book exam, closed book exam and observed structured clinical examination (OSCE)).
- Electronic Curriculum Mapping database which acts as a staff sharing centre for information about assessment items whilst providing evidence for accreditation requirements.
- Course-wide use of assessment rubrics with competency standards as the assessment criteria. This was combined with student checklists so that students could check their own progress against their competency standards.
- Course-wide portfolio or e-Portfolio assessment to simulate Continuing Professional Development (CPD), promote self-reflection, show development of competencies and

to provide students with a checklist to identify gaps in their knowledge and skills.

Portfolio was found to be compatible with, and complementary to other assessment methods.

Given the limited presence of Australian exemplars located in the international literature it was necessary to determine how educators and the profession more broadly currently utilise the NCS. Thus, the literature review is followed by the findings from online surveys with 527 Australian pharmacy stakeholders, which revealed suboptimal use of the NCS profession-wide. The 2013-2014 online survey findings evidenced poor familiarity with, and use of, the NCS amongst the profession, its educators and students. Despite being mandated, only 43% of practising pharmacists in Australia used the NCS to review their practice at re-registration, and fewer (23%) used them to plan their CPD. Of equal concern, and despite courses having to provide evidence that their graduates align with the NCS for accreditation, only 52% of students nationally reported knowing of their NCS. The findings from the online survey suggest that educators have a responsibility to improve awareness of the role and importance of the NCS amongst their pharmacy students.

To supplement the online survey results, 14 pharmacy educators were interviewed, providing an opportunity to explore the reasons for the scarcity of Australian exemplars in the international literature. From their responses, the current use of NCS in Australian pharmacy education could be characterised under curriculum review, design and accreditation, and for informing specific assessment tasks (for example, self-assessment, OSCE, oral examination and portfolio). Thematic analysis revealed three barriers and two enablers to the use of the NCS in Australian pharmacy education. These were;

Barrier 1. The NCS describe a competent practitioner, not a graduate. The NCS needs to describe a competence continuum from an undergraduate level onwards.

Barrier 2. The current format, volume and complexity of the NCS makes its application in the education setting and with students difficult.

Barrier 3. There is a lack of engagement with the NCS profession-wide.

Enabler 1. An external mandate requires that schools evidence their courses align with the NCS.

Enabler 2. The NCS provides the profession with a common language and shared understanding of how a pharmacist should practice.

These findings led to a number of recommendations to optimise the NCS for use in the education setting.

The poor knowledge of the NCS among students (discovered in the survey) became a primary focus for the thesis. In recognition that positive habit formation should begin early in the student/practitioner life-cycle, the TLR was conceptualised. An authentic assessment, the TLR was designed to increase student familiarity with their NCS and engage students in their learning through self-assessment, a “visible skill” essential for life-long learning. At the conclusion of Semesters 1 and 2 in 2014, pharmacy students at one Australian university were invited to self-assess their progress against the competency standards. The students were also asked to provide examples of where they felt each competency had been assessed in their course. Participating students received a report presenting their self-assessment against their academic results, as mapped and assessed by their educators. Amongst the 121 student participants (representing 42% and 26% of those invited in Semester 1 and 2, respectively), the intervention led to increased knowledge of the NCS whilst providing students with an opportunity to practice self-assessment skills. However not all students were convinced it would alter their approach to learning in the future. The limitations and lessons learnt from the intervention include the greater need for stakeholder engagement and the

requirement for additional student support resources to optimise its future impact on student learning now and into the future.

This research has implications for the profession, pharmacists, educators, students, regulators and the public. Overall it may inform the renewal and implementation of future NCS and influence those tasked with renewal of professional standards worldwide. As an incidental finding, the TLR was found to provide students and educators with a new, innovative and logical meeting point for a dialogue on assessment for Assurance of Learning (AoL). It may provide higher education with a mechanism to capture the student voice to inform curriculum review and design and prompt timely discussion on personalised learning plans for the professions and higher education more broadly.

The key findings from this research include;

- Currently, members of the Australian pharmacy profession, particularly students, report poor use and familiarity with their NCS.
- Despite a mandated requirement that courses evidence graduate alignment with NCS, few students were aware of the NCS and few educators made their role explicit to students.
- Internationally, some pharmacy educators describe exemplars of innovative and holistic use of competency standards for designing their pharmacy curricula and assessment. Whilst Australian pharmacy educators provide evidence of alignment with the NCS for the accreditation of their courses, their use could be made more explicit to students through practical application that assists student learning in their current context (e.g. self-assessment, e-Portfolio). Importantly these learning activities and assessments could be developed course-wide and enable students to picture themselves on the “competence continuum”.

- The TLR had mixed student outcomes and acceptance; although the TLR led to increased NCS familiarity and provided opportunities to practice self-assessment skills, most students reported it would not change their approach to their learning in the future. Students' suggestions to improve the TLR included embedding self-assessment and the TLR during tutorials and placements, introducing it from 1st year and using it across both semesters, continuing to use it with cohorts once in their internship and using a drop box system to enable downloads to mobile devices or linking the TLR into the Learning Management System. Peers in the sector suggested follow-up appointments with students to debrief their TLR results. Other suggestions to improve the intervention were to accompany the TLR with peer mentor activities as well as dedicated workshops to provide students with opportunities to develop self-assessment skills.
- By design the TLR created an alternative view of curriculum and a meeting point for students and their educators to discuss and review their assessed curriculum for AoL.

Australian pharmacy educators perceived a number of barriers and enablers to the use of NCS in pharmacy education. The TLR sought to address these barriers and improve poor student familiarity with the NCS alongside development of self-assessment skills, with the long term goal of improving the suboptimal life-long learning practice reported within the profession. Much more can be done by pharmacy educators to assure the public of competent practitioners and the safe provision of pharmacy services into the future. This approach has portability and promise for other professional disciplines within higher education more broadly.

Preface

Incorporating publication into thesis is a relatively new concept to Australia. The release of Guidelines by the University of Tasmania (May 2015) provides advice to candidates and examiners; *“any publications incorporated into the thesis must constitute an essential part of a coherent and integral body of work....the entire body of work should be focussed on a coherent research project composing a set of interrelated questions”*. In addition, *“as a general guideline, when the majority of a thesis is to be comprised of published papers, anywhere between three to eight papers bracketed between a substantive general introduction chapter (that lays a coherent foundation for the research) and a general discussion and conclusion(s) chapter (that draws the findings together and provides a clear statement concerning the findings) would be considered acceptable.”*

In line with the University of Tasmania’s Guidelines I submit six complementary Chapters containing a coherent exploration of the question: *“What is the impact on students of an educational intervention (Traffic Light Report) which uses self-assessment skills to highlight National Competency Standards for Pharmacists in Australia (NCS) in an Australian pharmacy program?”*

The relationships between my overarching question and sub-questions are explored throughout the thesis. Chapter 1 provides the context for this research and describes the rationale for the research approach. Chapters 2, 3, 4 and 5 explore each sub-question. Chapter 6 synthesises the findings from each of the sub-questions to answer the overarching thesis question. In recognition of the complexity of the higher education ecosystem and research in the delivery of education there is a resultant overlap whereby one publication may span more than one sub-research question. In recognition that each paper must stand alone there may be repetition of some figures, methods and findings.

This research was inspired by my students and my personal experiences as a pharmacist. In 2012 I observed assessment-focussed attitudes amongst my third year Bachelor of Pharmacy students and wished for them to see why this was destructive given what I knew as an experienced practising pharmacist. Rather than just telling them how important their competence, current learning and commitment to life-long learning was, I wished to make the message authentic and relevant to each individual student in their own context. In an attempt to foster future-focussed learning strategies, I sought to determine how pharmacy educators currently utilised their profession's competency standards in curriculum design and student learning elsewhere. Despite published exemplars of course-wide use of professional standards and educational outcomes internationally, there was a scarcity of published work from Australian pharmacy educators. In addressing this gap I found evidence to justify the need to increase Australian pharmacy students' familiarity with their profession's competency standards and introduce "visible learning" skills (self-assessment, self-evaluation, self-directed learning) earlier as undergraduates. Thus, the Traffic Light Report (TLR) was conceptualised.

Acknowledgements

The last three years have been an indulgent time of discovery of self. My PhD has presented me with many challenges and opportunities for personal learning and growth. I have been surprised by my reactions to my passion for learning and teaching, the pharmacy profession and the importance of upholding the quality of both. Thank you to all the pharmacists, pharmacy educators, students and others in the pharmacy, higher education and technology enhanced learning communities who have participated and contributed to my research. I hope the embedded publications influence your own practice and the global pharmacy community more broadly. I also hope the standard of this work adequately reflects the time and generosity of my participants and colleagues.

I would like to thank all of my family and friends for their ongoing support in all of my quests for personal improvement. I am acutely aware of the sacrifices which have been made over my 36 years to accommodate my dreams and for this I am deeply grateful. Thank you to my Grandma (93) and her parents who have instilled a rich family heritage of the value of education. I would like to thank my Mum for carrying on this family tradition and for the enormous sacrifices she made so that I could have an education. To my husband Michael, my anchor and my balance thank you for continually challenging my arguments, for your support and the time you have spent proof-reading my manuscripts. Thanks also to the other proof readers in my life, you know who you are; I will return the favour in time. Thomas - you were just a toddler when this journey began but both you and Madeleine have been so patient and understanding of having a mother who is also a student. My legacy to you both is that through joining me on my PhD journey you will appreciate the importance of education and health and take seriously your responsibility to contribute to your society. To Cameron (my twin brother and computer whiz) and Colin (my office room-mate and computer whiz), thank you for stepping in at the final hour and helping me with the queries required to

generate the TLR for my students on time. Thankyou to Peter Gee for his initial assistance with the design of my Access database. Cameron and Colin, although both of you highlighted what I wanted to do was very complex, I was floored that you shared my determination to make it happen. With every obstacle we faced together in the database you matched my willingness to overcome it; your selflessness is something seldom found today. I hope everyone in the 'new world' will have a brother or friend who are at least half the computer whizzes and as kind and generous as you.

Finally, thank you to my supervisors (Leanne, Ieva, Natalie, Greg and Shane) who have been so supportive of my research and energy. Without doubt you have each mastered the skill of taming my enthusiasm and turning it into productivity. Moving forward I promise to slow down, say it with less words, focus on the main messages and try to focus on one activity at a time (well, I did say try!).

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List of Conferences

Accepted Abstracts (2016)

- 1-4th July, 2016. Life-long Learning in Pharmacy (Split, Croatia) Theme: Sailing New Waters - Expand Your Horizons. Presentation Title: *Educating for professional competency and continuing professional development: Implications for undergraduate curriculum and life-long learning*. (Collaboration with PhD candidate Wendy Thompson from Queensland University of Technology (QUT)) - Candidate pre-prepared contribution and presented via asynchronous video file (ZOOM). <http://www.lllpharm.com/>
- 4-7th July, 2016. Higher Education Research and Development Society of Australasia HERDSA (Fremantle, Perth) Theme: The Shape of Higher Education - Showcase (oral) Presentation Title- *Changing the shape of AoL for higher education; initiative reveals disconnect between educators and students expectations of the performance level of assessment*. <http://herdsa2016.org/>

Conference Presentations (2012-2015)

2015.

- 4th June, 2015. University of Tasmania Health HDR Conference (Hobart); Poster presentation & Three Minute Thesis (3MT) People's choice; 1st place winner.
- 6-9th July, 2015. Higher Education Research and Development Society of Australasia HERDSA (Melbourne, Victoria) Theme: Learning for life and work in a complex world. Full Refereed Paper and Showcase (oral) Presentation Title – *A reciprocal relationship informing a profession's competency standards*.
<http://herdsa.org.au/publications/conference-proceedings/research-and-development-higher-education-vol-38>
- 14-16th July, 2015 Transforming Education Symposium (Hobart) *Personalised learning plans; transforming education for an uncertain future*. pg. 132
http://www.utas.edu.au/_data/assets/pdf_file/0005/768569/ET-visual-15.pdf
- 3-4th September, 2015 University of Tasmania Graduate Research Conference (Hobart); Poster presentation & 3MT finalist. Presentation Title- *Is your pharmacist up to standard?* 3MT YouTube Link: <https://youtu.be/99Q2FPS0OJA>
- 2nd December, 2015. Teaching Matters, The University of Tasmania (Hobart). Theme: Tasmanian Blends; Course Blends. Oral Presentation Title: *Traffic Light Report blends educators' view with their students' view to discover disconnect*.

2014

- 5-7th December, 2014. Australasian Pharmaceutical Science Association, APSA. (QUT, Brisbane, Queensland). Theme: Shaping Tomorrows' Practitioners Today. Linking Pharmacy Education to Practice. Two presentations. 1) Co-presented Education workshop (with Prof. Ieva Stupans): Workshop Title: *Pharmacy Threshold Learning Outcomes and Higher Education for capability*. 2) Oral Presentation Title: *Linking Education to Practice through student Traffic Light Report*. <http://apsa-online.org/files/2014ConferenceProceedings.pdf>
- 2nd December, 2014. Teaching Matters, University of Tasmania. (Hobart). Theme: Spaces and Places. Oral Presentation Title: *High Impact learning: Illuminating the profession's competency standards to Bachelor of Pharmacy students using individual Traffic Light Reports*. <http://www.utas.edu.au/teaching-matters/past-proceedings/volume-8-2014>

2013

- 5-7th December, 2013. Australasian Pharmaceutical Science Association, APSA. (Otago University, Dunedin, New Zealand). Poster Presentation Title: *An International review of the use of professional competencies within Pharmacy Education*. <http://apsa-online.org/files/2013ConferenceProceedings.pdf>

2012

- 1-3rd December, 2012. Australasian Pharmaceutical Science Association, APSA. (University of Sydney, Sydney). Two Poster Presentation(s): 1) *Competency Standards come to life for UTAS Bachelor of pharmacy undergraduates*. 2) *The UTAS Pharmacy student's Road Map*. <http://apsa-online.org/files/2012ConferenceProceedings.pdf>
- 4th December, 2012. Teaching Matters, University of Tasmania. (Launceston). Theme: Sustaining Futures – Considering sustainability across the learning and teaching divide. Oral Presentation Title: *Sustainable assessment 'meets the needs of the present and prepares students to meet their own future needs' (David Boud, 2000). Is this what students want?* <http://www.utas.edu.au/teaching-matters/past-proceedings/volume-6-2012>

Glossary

Please also refer to Table 4 found in Chapter 2.

Table 1. Glossary of Terms

Term	Definition
Assurance of Learning	The process by which learning outcomes are measured against specific course goals (Hall & Kro, 2006). A teaching team approach to course design to ensure student knowledge and skills are scaffolded and, importantly, educators and their students are aware of where this scaffolding takes place (AACSB International 2013, Lawson 2015).
Competencies	Knowledge, skills, behaviours and attitudes (International Pharmaceutical Federation Pharmacy Education Taskforce, 2012) that an individual accumulates, develops and acquires through education, training and work experience (Brown et al., 2012) OR Behaviours that individuals demonstrate when undertaking job-relevant tasks effectively within a given organisational context (Whiddett & Hollyforde, 2003).
Competence	Generally taken to mean that an individual possesses the required knowledge, skills and attributes sufficient to successfully and consistently perform a specific function or task to a desired standard (National Competency Standards Framework for Pharmacists in Australia, 2010, pp. 4-5).
Competency Framework/ Standards	Complete collection of competencies that are thought to be essential to performance (Brown et al., 2012).
Continuing Professional Development	Is the means by which members of the profession (pharmacy) continue to maintain, improve and broaden their knowledge, expertise and competence, and develop the personal and professional qualities required throughout their professional lives (Pharmacy Board of Australia, AHPRA, 2010).
Course	A program of study leading to an award, e.g. the Bachelor of Education course. All courses are made up of individual units (University of Tasmania, 2016). Referred to elsewhere as a program, programme.
Life-long learning	A continuously supportive process which stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding they will require throughout their lifetimes (Watson, 2003, p. 3).
Performance	Effective and persistent behaviour (Brown et al., 2012)
Practice	Means any role, whether remunerated or not, in which the individual uses their skills and knowledge as a pharmacist in their profession. For the purposes of this registration standard, practice is not restricted to the provision of direct clinical care. It also includes working in a direct non-clinical relationship with clients; working in management, administration, education, research, advisory, regulatory or policy development roles; and any other roles that impact on safe, effective delivery of services in the profession and/or use their professional skills (Pharmacy Board of Australia, AHPRA, 2010).
Unit	A set of lectures, seminars, tutorials and/or practicals on a particular topic, and the associated assessment. Each unit has a specific code (e.g. HEA101 Australian Literature) and a percentage weighting (e.g. 12.5%). (University of Tasmania, 2016) Referred to elsewhere as a course.

Term	Definition
Unit Outline	Described elsewhere as a syllabus, module outline, course outline. Essentially a contract between an enrolled student and the unit co-ordinator. Provides information essential to student learning including; learning outcomes, learning activities, assessment schedule, assessment details, contact details of the unit co-ordinator.
Visible Learning	When students become their own teachers and exhibit self-regulatory attributes that seem most desirable for learning (self-monitoring, self-evaluation, self-assessment, self-teaching) (Hattie, 2008, p.22).

Table 2. Education Terminology by country/continent

Europe (Katajavuori et.al. 2009)	United Kingdom (Sie et. al. 2003)	America/Canada (Bradberry et.al. 2007)	Australia (Marriott et. al. 2008)
Curriculum/Syllabus	Curriculum	Curriculum	Curriculum
Course	Modules	Course	Unit
Program	Course	Program	Course
Course Outline	Module Outline, Curriculum handbook, Study guide	Syllabus	Unit Outline

Abbreviations

Table 3. Abbreviations

	Acronym	Definition
A	AACP	Australian Association of Consultant Pharmacy
	AACSB	Association to Advance Collegiate Schools of Business
	ACT	Australian Capital Territory, Australia
	AHHA	Australian Hospitals and Healthcare Association
	AHPRA	Australian Health Practitioner Regulatory Agency
	AMEE	An International Association for Medical Education
	AoL	Assurance of Learning
	APC	Australian Pharmacy Council
	APPFA	Advanced Pharmacy Practice Framework for Australia
	APSA	Australasian Pharmaceutical Science Association
	AQF	Australian Qualifications Framework
B	B.Pharm	Bachelor of Pharmacy
C	CAP	Competency Assessment Plan
	CAPE	Centre for the Advancement of Pharmacy Education
	CE	Continuing Education
	CLO	Course Learning Outcomes
	CPD	Continuing Professional Development
	CR	Credit (60-69%)
	CS	Competency Standards
D	DN	Distinction (70-79%)
E	ECAR	Educause Centre for Analysis and Research
	ED	Educators

	Acronym	Definition
F	FIP	International Pharmaceutical Federation
G	GbCFv1	Global Competency Framework
	GPA	Grade Point Average
	GPEP	Good Pharmacy Education Practice
H	HERDSA	Higher Education Research and Development Society
	HD	High Distinction (80-100%)
	HDR	Higher Degree by Research
	HMR	Home Medication Review
	HoS	Head (s) of School
	HWA	Health Workforce Australia
I	ITP	Intern Training Program
	ITPC	Intern Training Program Co-ordinators
J		
K		
L	LINK	Learning innovation and networked knowledge
M		
N	N	No
	N	Number of participants
	NAPE	National Alliance for Pharmacy Education
	NCS	National Competency Standards Framework for Pharmacists in Australia
	NEHTA	National eHealth Transition Authority
	NSW	New South Wales, Australia
	NT	Northern Territory, Australia
	NVivo10	Computerised Qualitative Research Software tool

	Acronym	Definition
	NZ	New Zealand
O	OBE	Outcomes Based Education
	OBTL	Outcomes Based Teaching and Learning
O	OLT	Office of Learning and Teaching, Australia
	OSCE	Observed Structured Clinical Examination
P	PE	Pharmacy Educators
	PDL	Pharmaceutical Defence Limited
	PharmD	Doctor of Pharmacy- Professional doctorate degree.
	PharQA	Quality Assurance in European Pharmacy
	PhD	Doctor of Philosophy
	PhLOs	Pharmacy Threshold Learning Outcomes
	PPDC	Pharmacy Practitioner Development Committee
	PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
	PSA	Pharmaceutical Society of Australia
Q	QA	Quality Assurance
	QLD	Queensland, Australia
	QUT	Queensland University of Technology
R	RMIT	Royal Melbourne Institute of Technology
	RMMR	Residential Medication Management Review
	RN	Rose Nash
	RPSGB	Royal Pharmaceutical Society of Great Britain
	RUG	Registration Upon Graduation
S	SA	South Australia, Australia
	SD	Standard Deviation

	Acronym	Definition
	SDL	Self-Directed Learning
	SHPA	Society of Hospital Pharmacists Australia
	SMART	Specific, Measurable, Achievable, Relevant, Timed
S	SoP	School of Pharmacy
	SPSS	Statistics Package for the Social Sciences
	ST	Student
T	TAS	Tasmania, Australia
	TEQSA	Tertiary Education and Quality Standards Agency
	TILT	Tasmanian Institute of Learning and Teaching
	TLO	Threshold Learning Outcomes
	TLR	Traffic Light Report
U	UTAS	University of Tasmania
	UK	United Kingdom
	US	United States
V	VIC	Victoria, Australia
W	WA	Western Australia, Australia
	WHO	World Health Organisation
Y	Y	Yes
	3MT	Three Minute Thesis

Chapter 1. Context

Introduction

In this Chapter I outline the purpose and importance of this thesis incorporating publication. This chapter summarises the context in which this research was carried out and its contribution to higher education and the pharmacy profession more broadly. Firstly, I present a brief overview of the research problem highlighting the significance of the topic under investigation. I discuss the current status of the pharmacy profession and pharmacy education and the essential hinge provided to each by the National Competency Standards for Pharmacists in Australia (NCS). I provide a background on curriculum and assessment designed for learning, including features which influenced this research, specifically the Traffic Light Report (TLR) educational intervention. Summarised by the guide to the thesis, I will describe how each sub-question contributes to the over-arching research question. A methodology and methods section then provides a literature informed background to each of the three components that are incorporated in the TLR. Table 1 provides a useful Glossary of Terms, Table 2 provides educational terminology by country/continent and Table 3 lists the abbreviations used throughout the text.

Research Problem

New medicines and healthcare initiatives emerge daily. In the health disciplines such as pharmacy, knowledge gained as an undergraduate outdates quickly. This phenomenon has been described by others as the shrinking knowledge half-life (Siemens, 2005). Services based on outdated health knowledge can place the public at unacceptable risk. These factors reinforce the need for pharmacists to engage in meaningful life-long learning.

Health care is a complex system. With this complexity come expanding roles, increased responsibility and an increased requirement for life-long learning. World-wide, the pharmacist's role in the health care team is continually evolving. Although traditionally a production and distribution role, increasingly clinical knowledge, communication and teamwork skills and the title of "Medicines Expert" define today's pharmacists (International Pharmaceutical Federation Pharmacy Education Taskforce, 2012). For public safety and the viability of the profession pharmacists must be flexible and continually adapt. The expansion and adaptation of roles must be informed by standards to ensure patient safety and a consistent, quality health service. Since the introduction of the concept of competence in the 1960s (Brownie, 2011), competence frameworks have been utilised worldwide to communicate the desired knowledge, skills and attributes of health professionals (Brown, Gilbert, Bruno, & Cooper, 2012; Brownie, 2011).

The International Pharmaceutical Federation (FIP) has developed a Global Competency Framework which promotes the use of competency standards to '*facilitate education, development and capacity to meet the needs to sustain a pharmacy workforce relevant to country-level needs.*' (International Pharmaceutical Federation Pharmacy Education Taskforce, 2012, p. 16). Having a set of standards against which pharmacists can compare their current practice is an essential safety mechanism. Internationally there is a move towards "needs based" education (Anderson et al., 2012), which recognises the importance of curriculum aligned to a profession's local competency standards. Competency frameworks hold little value if they do not inform practice or the education of future practitioners.

In preparing our future health professionals for practice we must be focussed on providing them with essential skills for the future. So how might educators best prepare our future practitioners for roles that don't yet exist and a healthcare system fraught with uncertainty? It follows that in the delivery of the "current" we must embed visible-learning skills (Hattie,

2008), such as self-assessment as precursors for a graduate's independent life-long learning.

In 1999, Boud described self-assessment as a defining attribute of someone who is a professional. He highlighted the importance of self-assessment to the education of professional disciplines and urged that courses include professional knowledge and professional practice rather than just content (Boud, 1999).

The current use of competency frameworks by pharmacists in Australia was not easily found in the literature prior to 2012; less could be found about their use by Australian pharmacy educators (Nash, Chalmers, Brown, Jackson, & Peterson, 2015). Pharmacy educators may play an important role in the renewal of competency standards to ensure their usability across all spectrums of pharmacy, particularly education. Optimised use in the education setting may result in improved engagement with the NCS amongst the profession. More than ever, the professional disciplines are required to foster life-long learning attitudes amongst students (Boud & Falchikov, 2005; S. Brown, 2004; Mumm, Karm, & Remmik, 2015). A profession's competency standards may be central to educators achieving this goal.

1.1 Pharmacy Profession

In Australia and internationally there is an essential relationship between continuing professional development (CPD), life-long learning and competency standards. If applied together and meaningfully they could assure the competence of the entire profession.

The NCS describe the requisite knowledge, skills and attitudes of an "entry level" practising pharmacist (National Competency Standards Framework for Pharmacists in Australia, 2010).

The NCS 2010 define competence;

'to mean that an individual possesses the required knowledge, skills and attributes sufficient to successfully and consistently perform a specific function or task to a desired standard.' (National Competency Standards Framework for Pharmacists in Australia, 2010, pp. 4-5).

The NCS include eight domains which in turn each contain competency standards, elements and performance criteria. The eight domains are: 1) Professional and ethical practice, 2) Communication, collaboration and self-management, 3) Leadership and management, 4) Review and supply prescribed medicines, 5) Prepare pharmaceutical products, 6) Deliver primary and preventative health care, 7) Promote and contribute to optimal use of medicines and 8) Critical analysis, research and education. The NCS 2010 were intended to be used for multiple purposes by individuals and organisations. The purposes most relevant to the research presented here include;

- Pharmacists: assist in the preparation of procedures that will facilitate self-assessment of competence for any area of pharmacy practice,
- Universities: assist in developing curricula for courses leading to graduation as a pharmacist,
- Australian Pharmacy Council: assist in the evaluation of pharmacy courses,
- CPD providers: assist in developing educational material or courses for pharmacists,
- Registering authority: assist in developing procedures to assure the competence of applicants for re-registration.

Competency standards are regularly renewed to reflect changes in service delivery and new roles. The Australian pharmacy profession will launch their renewed NCS in 2016 (Australian Hospitals and Healthcare Association., 2014). Rapid changes in healthcare also place additional emphasis on the need for all pharmacists to engage in life-long learning in order to maintain and extend their competence to practice. Life-long learning is defined as

'a continuously supportive process which stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding they will require throughout their lifetimes.' (Watson, 2003, p. 3).

In the past pharmacists participated in didactic (lecture style) Continuing Education (CE) sessions to maintain their knowledge and skills (competence) to practice (McConnell,

Newlon, & Delate, 2010). When introduced, CPD was considered superior to traditional CE as it encouraged health professionals to reflect on their specific learning needs based on their current roles and then choose the learning activities that would meet those needs and improve their skills (McConnell, et al., 2010). A structured form of life-long learning for health professionals, CPD uses a four stage framework to encourage practitioners to plan, act, reflect and evaluate their learning, and record and review at the end of each cycle (McConnell, et al., 2010).

To inform their ongoing learning needs, pharmacists in Australia are encouraged to determine the most relevant competency standards required for their individual practice context (National Competency Standards Framework for Pharmacists in Australia, 2010). Despite Australian pharmacy CPD providers listing relevant NCS associated with CPD learning activities in the past, the NCS did not appear to influence Australian pharmacists' approach to CPD (Nash, Chalmers, Stupans, & Brown, 2016). This may be a result of narrow interpretation of CPD as a record of learning, uncertainty about how to apply the four stage CPD framework or an incorrect assumption that CPD is the same as CE (Thompson, Nissen, & Hayward, 2013). In 2012, members of the profession reported that the NCS were an afterthought, "ticked off" alongside the forty credits required for re-registration (Thompson, et al., 2013). Practitioners had not been utilising the NCS to conduct a gap analysis of their learning needs, nor did they report they constructed personalised CPD plans; this practice was far removed from best practice guidelines internationally.

Internationally, pharmacy educators state that CPD is moving towards

'greater emphasis on self-direction, self-assessment of learning needs and goals, direct relevance of the learning to the practitioner's daily practice, and practice change'
(Tran, Tofade, Thakkar, & Rouse, 2014 pg. 4)

As described by Nash et al. (2016) the pharmacy profession worldwide is responding to this movement and encouraging meaningful CPD practices with strategies such as;

- integration of peer review (Austin, Marini, Glover, & Tabak, 2006),
- accredited learning facilitators (Pharmacy Council of New Zealand., 2012),
- mentor programs (Austin, et al., 2006; Royal Pharmaceutical Society., 2012),
- credentialing and privileging (Council on Credentialing in Pharmacy, 2014) and
- portfolio evidence (Tofade, Khandoobhai, & Leadon, 2012).

Guidance on CPD provided by the FIP (International Pharmaceutical Federation., 2002) and educators of the health disciplines (Eva & Regehr, 2008; Eva & Regehr, 2005) recognise self-assessment as key to CPD cycles.

The Pharmacy Board of Australia mandates that pharmacists maintain their competence to practice through meaningful CPD (Pharmacy Board of Australia, 2015). For re-registration in Australia, the Pharmacy Board of Australia now make explicit that pharmacists are to self-assess their individual needs with reference to the NCS, document forty credits (points) of relevant CPD practice each year and sign a statutory declaration annually declaring their fitness to practice at the point of re-registration (Pharmacy Board of Australia, 2015). The Pharmacy Board of Australia currently audits practitioners to determine currency of practice. When renewed in December 2015, the CPD standards required that all pharmacists evidence a personalised CPD plan that makes explicit reference to the NCS;

'To meet this registration standard you must plan your CPD on an annual basis by reflecting on the role you perform and the services you provide (i.e. your scope of practice), and any proposed changes to your practice, against the current National Competency Standards Framework for Pharmacists in Australia to identify relevant competencies' (Pharmacy Board of Australia, 2015, p. 2)

Society and therefore the profession require that its pharmacy practitioners engage in meaningful life-long learning, with reference to their relevant competency standards and

evidence this in their CPD records. This has very real implications for how we can best educate our future pharmacists so they are equipped to practice meaningful life-long learning and practice competently. The next section will explore the regulatory framework which surrounds the education of future pharmacists and the role of the NCS in these requirements.

1.2 Pharmacy Education

As a minimum requirement pharmacists in Australia must have completed a Bachelor degree or Master degree and one year of supervised practice or equivalent. For confidence in the quality of our future pharmacists, pharmacy graduates must be awarded their qualification from an accredited higher education provider. In Australia, higher education providers self-regulate their compliance with the Higher Education Standards (Australian Government Department of Education and Training, 2015). The Tertiary Education Quality Standards Agency (TEQSA) was established in 2011 to oversee the quality of courses and ensure that graduates are consistent with the Australian Qualifications Framework (AQF) descriptors for that course (Australian Qualifications Framework Council., 2013).

The AQF descriptors define the relative complexity and depth of achievement and autonomy required of graduates to demonstrate achievement for their degree level, specifically the knowledge, skills and application of each. For example, the AQF makes explicit that a Bachelor graduate must be a responsible and accountable learner, and be equipped with a solid foundation for independent life-long learning (Australian Qualifications Framework Council., 2013, p. 48). The importance of life-long learning to the pharmacy profession and this research has been highlighted in Section 1.1 – Pharmacy profession, and will be expanded on further in Section 1.3 – Curriculum and assessment designed for learning.

In 2010, TEQSA required that all disciplines harmonise with relevant and endorsed Threshold Learning Outcomes (TLOs).

‘TLOs are the expression of the minimum set of knowledge, skills and the application of the knowledge and skills a person has acquired and is able to demonstrate in order to pass the qualification’ (Jones, Yates, & Kelder, 2011, p. 3).

Similar in intent to the Bologna declaration (Bologna Declaration., 1999), the use of the AQF descriptors and TLOs was to ensure all students exiting Australian higher education courses were comparable at graduation. In response to TEQSA’s requirement, the pharmacy discipline sought to harmonise with the Health, Medicine and Veterinary Science Threshold Learning Outcomes. By 2014, the Pharmacy Threshold Learning Outcomes (PhLOs) (Stupans et al., 2014) were written and endorsed by pharmacy educators nationally. The NCS were one reference point in the development of the PhLOs.

Unlike some of their international counterparts, Australian pharmacy graduates do not register at the point of graduation, rather they have a year-long supervised internship in the practice setting. Throughout this year graduates will participate in an intern training program. At the conclusion of the internship, graduates are signed off by their preceptor (pharmacist supervisor) and sit a registration examination with the Pharmacy Board of Australia (Marriott et al., 2008). Thus, the PhLOs describe a student at graduation, whereas the NCS describe a pharmacist upon registration, following their internship.

The PhLOs were still in development at the commencement of this research. As a result the NCS were utilised in this research as a reference point for our students. This was also in recognition that students were at the beginning of their journey on the “competence continuum” and would require familiarity with their profession’s competency standards in the future. Coombes et. al. support this approach in their statement that

‘capability is a dimension of professional practice which exists as a continuum from the lowest to the highest level of performance. Progression within the early years of this continuum should be continuous from undergraduate, to intern to a day one registered pharmacist’ (Coombes, Bates, Duggan, & Galbraith, 2011, p. 17).

Prior to the development of the PhLOs, the Advanced Pharmacy Practice Framework Steering Committee provided educators with the customised entry level competency tool (also referred to as the Professional Practice Profile for Initial Registration as a Pharmacist) (Advanced Pharmacy Practice Framework Steering Committee, 2011). Released in 2011, its role was to communicate the responsibility of pharmacy schools and that of the internship programs in addressing the various NCS. Anecdotal feedback from pharmacy educators provided throughout the qualitative interviews suggest its uptake and application by pharmacy educators in Australia has been variable.

In addition to the TEQSA requirements, professional disciplines such as pharmacy undergo external accreditation with professional regulatory agencies. The Australian Pharmacy Council (APC) requires that Australian pharmacy schools provide evidence that their courses adequately prepare graduates for the workplace (Australian Pharmacy Council, 2012).

Currently, as part of their accreditation requirements pharmacy schools are encouraged to ensure their courses align with the NCS (Australian Pharmacy Council, 2012; National Competency Standards Framework for Pharmacists in Australia, 2010). As described previously, the intern year can provide an awkward gap for university educators attempting to evidence student learning against the NCS.

In a rapidly changing higher education landscape, it is vital we ensure the currency and quality of our courses. This is particularly important for educators of the health professions, including pharmacy. Pharmacy graduates must be aligned with industry. A course that does not deliver on currency and quality could have significant implications for the healthcare consumer and the graduate.

1.3 Curriculum and assessment designed for learning

This section discusses best practice curriculum design principles and assessment strategies of particular relevance to designing an educational intervention to promote optimal learning for

students of the health professions. Those that specifically informed the design of the TLR include;

- outcomes based education (OBE) (Bradberry et al., 2007; Harden, Crosby, & Davis, 1999; Ho et al., 2009; Spady, 1994; Spady, 1988),
- constructive alignment (Biggs, 1996; Biggs & Tang, 2011, p. 97),
- spiral curriculum design (Harden & Stamper, 1999),
- blueprinting (Hamdy, 2006),
- curriculum mapping (Harden, 2001; Kelley, McAuley, Wallace, & Frank, 2008; Lawson, 2014, 2015; Lawson et al., 2013; Oliver, Ferns, Whelan, & Lilly, 2010; Plaza, Draugalis, Slack, Skrepnek, & Sauer, 2007; Weiss & Levison, 2000; Willett, 2008),
- authentic assessment (Fullan & Scott, 2014; Kearney, 2012; Scott, 2015),
- assessment for learning (Mumm, et al., 2015) and
- assurance of learning (AACSB International., 2013; Hall & Kro, 2006; Lawson, 2015).

Increasingly technology enhanced learning strategies such as learning analytics and data mining have been recognised for their ability to support students in their learning (Papamitsiou & Economides, 2014). Some of the above examples of curriculum design and assessment for learning will now be discussed.

Pharmacy educators worldwide are increasingly focussed on outcomes based education (OBE). Since the shift to OBE in the 1980s (Spady, 1988) there have been changes in the manner we monitor, evaluate and evidence the quality of higher education. The move away from the indicative (input model) towards outcomes based measures is evident in the renewed 2012 Accreditation Standards for pharmacy programs in Australia and New Zealand.

Government and employer expectations require that graduates have developed necessary skills and attributes rather than a knowledge base alone (Boud, Lawson, & Thompson, 2013; Lawson, Taylor, Papadopoulos, Fallshaw, & Zanko, 2010; Oliver, 2010, 2016; Oliver, Jones, Ferns, & Tucker, 2007).

Quality enhancement in higher education encompasses the dimensions of assurance and improvement in the quality of units and courses delivered by higher education institutions.

Quality in higher education can be defined as *'fitness for purpose, fitness of purpose and performance to an agreed standard'* (Krause et al., 2014, p. 79). Assurance is defined as the process of ensuring that activities and outcomes meet an agreed standard (Krause, et al., 2014). Increasingly, quality enhancement which reflects a continuous quality effort through process improvement is the preferred term in higher education learning and teaching networks (Macquarie University., 2016).

To ensure fitness of purpose a course needs to be designed so that the learning activities and assessment tasks are constructively aligned with the learning outcomes that are intended in the course (Hattie, 2009). To ensure fitness for purpose the intended outcomes for a course must be written with industry stakeholder involvement or consideration of that profession's competency standards to ensure graduates will match workplace requirements.

Evaluation of higher education courses must be focussed on student learning (Edstrom, 2008), particularly meaningful learning (Ryan, Hanrahan, Krass, Sainsbury, & Smith, 2009).

Leading the charge, in 2003 the Association to Advance Collegiate Schools of Business (AACSB) ratified new standards which contained "Assurance of Learning" standards for Business Schools (AACSB International., 2013). Since, Assurance of Learning (AoL) strategies to ensure the quality of higher education have been applied internationally. AoL can be simply described as the process by which student learning outcomes are measured against specific course goals (Hall & Kro, 2006). AoL requires a "teaching team" approach to

course design to ensure student knowledge and skills are scaffolded (developed over time or built upon) and, importantly, that educators and their students are aware of where this scaffolding takes place (AACSB International., 2013; Lawson, 2014; Lawson, et al., 2013; Lawson et al., 2015).

Whilst an appropriately designed curriculum can fulfil AoL requirements, it can also support students to develop life-long learning skills. The importance of life-long learning to pharmacists was outlined in 1.1 – Pharmacy profession. Educators of professional disciplines increasingly recognise the importance of life-long learning skills (Ryan, et al., 2009), which are now a minimum requirement for all university graduates (Berdrow & Evers, 2011). Self-assessment is one essential skill for the practice of life-long learning amongst health professionals (Sargeant et al., 2010).

Self-assessment can be defined as *‘a process of interpreting data about our own performance and comparing it to an explicit or implicit standard.’* (Epstein, Siegel, & Silberman, 2008, p. 11). Whilst educationalists recognise the essential relationship between self-assessment and self-reflection, the two practices are often reported on separately in the education literature (Boud, 1995, 1999). Reflection and self-assessment have become essential practices in the education of the professions (Boud, 1999). Reflection occupies a wider territory than self-assessment (Boud, 1999), however in order to engage appropriately in reflection, self-regulation and self-directed learning a student must be capable of accurate self-assessment (Sargeant, et al., 2010).

Self-assessment at a tertiary level is recognised as an essential pedagogical and assessment tool to support students transitioning to professional careers (Bourke, 2014; Ronfeldt & Grossman, 2008). Australian pharmacy educators have recognised its role in supporting student learning whilst in placement based learning environments (Stupans, March, & Owen, 2013; Stupans et al., 2012). The role of assessment, specifically self-assessment for student

learning, has been evidenced in the literature (Andrade & Du, 2005; Andrade & Valtcheva, 2009; Bourke, 2014; Gordon, 1992; Leach, 2010; Motycka, Rose, Ried, & Brazeau, 2010; Mumm, et al., 2015; Sargeant, et al., 2010; Sargeant et al., 2011; Sluijsmans, Dochy, & Moerkerke, 1998). Whilst feedback from formative assessment has been shown to positively affect student learning (Sadler, 1989), formative assessment by others (peers, teachers, computers) will have little impact on learning unless it influences a student's own self-assessment (Boud, 1995). For this impact to be realised students will require opportunities to develop their self-assessment skills.

Life-long learning skills such as self-assessment can be developed at university through “sustainable assessment.” Sustainable assessment can be defined as

‘assessment that meets the needs of the present without compromising the ability of students to meet their own future learning needs.’ (Boud, 2000, p. 151).

Boud (2010) described four conceptual features of life-long learning; being sustainable, developing informed judgement, constructing reflexive learners and forming the becoming practitioner. Educators who employ assessment which is on “double-duty” (Boud, 2000) can provide their students with opportunities to develop and practice these skills. An educator's assessment choices can have a significant impact on their students' learning now and in the future (Ben-David, 2000; Ben-David, 1999; Boud, 1999; Boud, 2000; Boud & Falchikov, 2005; Garavalia, Marken, & Sommi, 2002; Gibbs & Simpson, 2004; Mumm, et al., 2015). The importance of engaging students in their learning using strategies such as self-assessment, grade prediction, self-reflection and self-directed learning is evidenced by “sustainable assessment” (Boud, 2000; Boud & Falchikov, 2005; Boud & Soler, 2015) and “assessment for learning” strategies (Mumm, et al., 2015).

Hattie describes similar skills in his “visible learning” skills framework. Hattie described visible learning as when

'students become their own teachers and exhibit self-regulatory attributes that seem most desirable for learning (self-monitoring, self-evaluation, self-assessment, self-teaching)' (Hattie, 2008, p. 22).

Hattie's meta-analysis found self-report of grades, metacognitive skills and feedback were listed in the top 13 strategies of 138 to have an impact on student learning. Most of these skills are inextricably linked (Boud, 2000), can be learnt (Moon, 1999; Sharif, Gifford, Morris, & Barber, 2007) and should be practised (Boud & Falchikov, 2005; Kearney, 2012; McMillan & Hearn, 2008; Tofade, Khandoobhai, & Leadon, 2012). Educators can design their curriculum to support students to develop their requisite knowledge, skills and attributes. Relevant to this research, skills such as self-assessment are minimum requirements for the meaningful practice of CPD and life-long learning.

Another equally important consideration in the design of curriculum and assessment is to ensure each can facilitate the integration of knowledge, skills and attributes. The Association of American Colleges and Universities previously stated

'one of the great challenges in higher education is to foster students' abilities to integrate their learning across contexts and over time' (Huber & Hutchings, 2004).

There are examples in the literature of educational tools and approaches which can provide students and educators with an appreciation of a curriculum course-wide (Harden, 2006; Lawson, 2015). The value of these approaches include a shared understanding of the course among students and educators, student appreciation for the relevance of learning, increased student motivation for learning, student integration and application of learning, calibration of educator expectations course-wide and the collation of course-wide evidence of learning for accreditation requirements. Examples include but are not limited to curriculum mapping, blueprints, course level assessment (progress testing), capstone assessment, e-Portfolio and course level rubrics. Specific examples of these are discussed in Section 1.5 – Components of the TLR.

Over the last six years, learning analytics and education data mining have grown exponentially and revolutionised higher education (Papamitsiou & Economides, 2014). Technology enhanced learning experts such as George Siemens and Jim Groom alongside educationalist such as Gardner Campbell have pushed the boundaries to maximise students learning environments. Carefully presented educational data constructed by or for students from learning management systems, blogs and e-Portfolio can support student centred learning, particularly when accompanied by educators who stimulate students to utilise effective learning strategies, such as self-assessment. The Traffic Light Report (TLR) takes advantage of technology in the form of a programmable database to provide its learners with summarised information of their learning (learning analytics) to communicate their progress against their profession's competency standards from multiple assessments over the duration of a semester. This information is designed to inform and motivate each student in their approach to their learning now and in the future.

Guide to the Thesis

1.4 Research Question

What is the impact on students of an educational intervention (Traffic Light Report) which highlights National Competency Standards for Pharmacists in Australia (NCS) and self-assessment skills in an Australian pharmacy program?

As outlined in Figure 1 (pg. 18), Chapters 2-5 are comprised of publications which answer each of the seven sub-questions. Chapter 1 sets the scene and provides the rationale for this research. Chapter 6 synthesises the findings from each of the sub-questions to answer the over-arching research question.

1.5 Research Sub-Questions

Each of the following questions informs one another and builds on the previous sub-question's findings to answer the over-arching research question. Chapter 1 provides the background and justification for the research. Chapter 2 is international in scope and sought to answer the following sub-question;

Q1. How are the competency standards utilised program-wide to design pharmacy education internationally? (Literature review- Chapter 2, Paper 1)

Chapters 3 and 4 were focussed on the Australian pharmacy context and sought to answer the sub-questions;

Q2. What is the current familiarity, perceived relevance and use of the NCS for pharmacists, students and educators in Australia? What are the implications for pharmacy education?

(Online Surveys- Chapter 3, Paper 2)

Q3. What are the current barriers and enablers to the use of NCS in Australian Pharmacy Education? (Qualitative Interviews- Chapter 4, Paper 3)

Building on the survey findings reported on in Chapter 3, Chapter 4 describes Australian pharmacy educators' accounts of current practice in pharmacy education in Australia. The educators' qualitative responses and reported barriers and enablers led to a set of recommendations, useful to both the profession and its educators. Importantly the emergent themes provide advice to strengthen future use of the profession's NCS and educational interventions.

Finally, taking into account the findings from Chapters 2, 3 and 4, I conceptualised an educational intervention intended to bring the profession's competency standards to life for pharmacy undergraduates at one Australian university. Unlike the other chapters which answer one sub-question at a time, Chapter 5 answers four sub-questions;

Q4. Can the Traffic Light Report increase student familiarity with the NCS? (Educational Intervention- Chapter 5, Book Chapter)

Q5. Does the Traffic Light Report stimulate self-assessment skills development? (Educational Intervention- Chapter 5, Paper 5)

Q6. Can the Traffic Light Report be utilised as a new technique for Assurance of Learning? (Educational Intervention- Chapter 5, Paper 6)

Q7. What are the lessons learnt from the implementation of an educational intervention (Traffic Light Report)? (Educational Intervention - Chapter 5, Book Chapter, Paper 5 and 6)

I sought to determine if the TLR could increase student familiarity with the NCS and stimulate the development of self-assessment skills essential for life-long learning. The findings revealed a number of advantages and lessons learnt from the Traffic Light Report. An unexpected outcome emergent from the educational intervention's findings concludes Chapter 5. Chapter 6 provides a synthesis of the research findings and a response to the overarching research question.

1.6 Thesis Layout

Figure 1. Thesis Layout

What is the impact on students of an educational intervention (Traffic Light Report) which highlights National Competency Standards for Pharmacists in Australia (NCS) and self-assessment skills in an Australian pharmacy program?		
Chapter 1 Context		
Q1. How are competency standards utilised program-wide to design pharmacy education internationally?	Chapter 2 Systematised Review of the Pharmacy Education Literature; International use of Competency Standards	Embedded Publication Nash, R., Chalmers, L., Brown, N., Jackson, S., and Peterson, G. (2015). An international review of program wide use of competency standards in pharmacy education. <i>Pharmacy Education Journal</i> 15(1), 131-141.
Q2. What is the current familiarity, perceived relevance and use of the NCS for pharmacists, students and educators in Australia? What are the implications for pharmacy education?	Chapter 3 Australian Pharmacy Education and Practice; current familiarity and use of NCS	Embedded Publication Nash, R., Chalmers, L., Stupans, I., and Brown, N. (2016). Knowledge, use and perceived relevance of a profession's Competency Standards; Implications for Pharmacy Education. [Early view-21/04/2016]. <i>International Journal of Pharmacy Practice</i> . DOI: 10.1111/ijpp.12267
Q3. What are the current barriers and enablers to the use of NCS in Australian Pharmacy Education?	Chapter 4 Australian Pharmacy Educators; current use (barriers and enablers) to NCS	Embedded Publication Nash, R., Chalmers, L., Stupans, I., and Brown, N. (2015). A reciprocal relationship: informing a profession's competency standards. Paper presented; Higher Education Research and Development Society of Australasia (HERDSA), Melbourne, Australia.
Q4. Can the Traffic Light Report increase student familiarity with the NCS?	Chapter 5 Educational Intervention; Traffic Light Report	Embedded Publications (5a) Nash, R., Chalmers, L., Stupans, I., & Brown, N. Sustainable? Traffic Light Report combines competency standards and self-assessment for students' life-long learning. In F. Padro, K. Trimmer, D. Thorpe & T. Newman (Eds.), <i>Higher Education in the Professions: Case Study Illustrations of Quality Practice</i> . Toowoomba: University of Southern Queensland. [IN PRESS 30/6/2016].
Q5. Does the Traffic Light Report stimulate self-assessment skills development?		Embedded Publication (5b) Nash, R., Stupans, I., Chalmers, L., and Brown, N. Content knowledge has a use by date, self-assessment skills last a lifetime. <i>Journal of Teaching and Learning for Graduate Employability</i> [IN REVIEW 30/06/2016].
Q6. Can the Traffic Light Report be utilised as a tool for Assurance of Learning?		Embedded Publication (5c) Nash, R., Stupans, I., Chalmers, L., and Brown, N. (2016). Traffic Light Report provides a new technique for Assurance of Learning. <i>Journal of Learning Design</i> , 9(1), 37-54. doi: http://dx.doi.org/10.5204/jld.v9i1.264
Q7. What are the lessons learnt from the implementation of an educational intervention? (Traffic Light Report)		
Chapter 6 Conclusions		

Methodology and Methods

1.7 Methodology

The following section describes the methodological framework in which this research was conducted. Within Creswell's (2013) four alternate knowledge claims (Postpositivism, Constructivism, Advocacy/Participatory and Pragmatism) the authors were positioned within a pragmatist assumption paradigm; that is a problem centred, real world practice orientated inquiry approach. Through the pragmatist position we could explore student awareness and acceptance of their profession's NCS and determine the influences on their current attitudes to learning. The research applied a concurrent strategy of enquiry (Creswell, 2013) with elements of Participatory Action Research (Creswell, 2013) and Educational Design Research (Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006) philosophies.

Participatory Action Research is understood to '*contain an action agenda for reform that may change the lives of the participants, the institutions in which the individuals work or live and the researcher's life*' (Creswell, 2013, pg. 9). Educational Design Research on the other hand, can be described as '*carefully studying progressive approximations of ideal interventions in their target setting, researchers and practitioners construct increasingly workable and effective interventions, with improved articulation of principles which underpin their impact*' (Van den Akker et al, 2006, pg 2).

Mixed methods techniques (qualitative and quantitative) to collect and analyse the data were employed. Mixed methods are consistent with the strategy of enquiry. Data were collected from a variety of sources including literature review, surveys, interviews and the educational intervention. The literature review represented an international perspective including Australian pharmacy practice and education. The surveys and interviews were focussed on the Australian context. Participants from the surveys and interviews included Australian pharmacists, educators and students. The literature, survey and interviews provided the

background and became the justification for the educational intervention. The educational intervention was designed for undergraduate pharmacy students at one Australian university.

Through triangulating the data (Creswell, 2013) from the various sources, the validity and reliability of the results were further assured. For example, the survey and interview results were interpreted together to gain richer insight into the current use of the NCS in pharmacy education. The educators' survey responses were cross checked with the student responses for consistency of reports on current practices in Australian pharmacy education.

In all styles of research, researchers may unintentionally influence their research findings (Creswell, 2013). A number of steps were taken in the design, collection and analysis phase of each source of data to reduce this effect. Where possible participant data was anonymous. Use of the Limewire survey tool (LimeSurvey Project Team, Hamburg) made it possible to ensure the anonymity of the survey respondents. Where anonymity was not possible, for example to conduct the interviews with pharmacy educators, the data were later de-identified. Survey comments and interview transcripts were given unique identifiers prior to qualitative analysis.

In the analysis phase SPSSv22 (IBM Corp, New York) was utilised for the analysis of the quantitative data. Techniques were informed by Pallant's SPSS survival manual (Pallant, 2013). At times the SPSS results were cross checked by a second statistician in statistical program 'R'. On a few occasions the candidate cross checked both using manual statistical calculations.

In most cases NVivo10 (QSR International) was employed in the analysis of the qualitative data. Thematic analysis techniques as described by Braun and Clarke (2006) were applied to the qualitative data obtained from the survey and interview respondents. Methodological measures to ensure the consistency, validity and reliability of the qualitative data were

informed by Bazeley (2010) and Birks and Mills (2011). Specifically, I employed member checking, coding consistency checks, consultation with a second researcher for face validity checks of the node structure, and coding rules. Reliability measures included a project log, field notes, memos and interpretation of coding stripes.

Each paper embedded within the Thesis also includes its own methodology and/or methods section.

The sources which specifically influenced the TLR design included the literature, surveys and interview findings. The TLR design and its components will each be discussed in the next section.

1.8 Components of the Traffic Light Report

Internationally, particularly in the United States of America, pharmacy educators utilise their competency standards to inform curriculum design, review and student assessment. They are reflected in observed structured clinical exams (OSCEs), portfolios, and programme level assessments, but also have a role in curriculum design, review and mapping, quality assurance, benchmarking and acceptance into pharmacy programmes and placements (Nash, et al., 2015). The international initiatives that directly influenced this research, specifically the TLR educational intervention include progress testing, curriculum mapping and portfolio assessment.

Progress tests assess students across their whole curriculum, requiring students to integrate their knowledge and skills from multiple time points and units of learning (Kelley, Beatty, Legg, & McAuley, 2008; Kelley & Demb, 2006; Plaza, 2007). The use of progress testing increased following the release of the Accreditation Council for Pharmacy Education standards on July 1st 2007 (Bradberry, et al., 2007), which required its schools to document student learning and retention of knowledge for their course accreditation. The emergence of

annual competence-based and programme level assessment (specifically looking at competencies) provides pharmacy educators and students with a powerful gauge for their progress in a programme (Kelley & Demb, 2006; Kelley, McAuley, et al., 2008). Pharmacy educators internationally highlight that competency-based assessment should not rely on one form or instance of assessment (McMahon & Henman, 2007; Mészáros, et al., 2009). One example, the Triple jump test (Mészáros et al., 2009) required students to complete three forms of programme wide assessment including an open book exam, closed book exam and an OSCE. Another example, the MileMarker (Szilagyi, 2008) introduced at the University of Houston College of Pharmacy, is an annual comprehensive assessment to evaluate student learning and retention at each level of the didactic portion of the curriculum. Upon completion students received an annual report based on their “progress”. Through programme level assessment, students and academics alike may better realise the relevance of individual programmes to the overall curriculum and aspired final product, and hopefully diminish the reported disconnect between students’ and educators’ perceptions (Kelley & Demb, 2006; Kelley, McAuley, et al., 2008).

Curriculum mapping is another technique which facilitates the integration of learning course-wide. Since its rise in popularity due to Harden’s use of it in medical education (Harden, 2001; Harden & Stamper, 1999), curriculum mapping techniques have provided individual educators with an appreciation for how their unit fits into the overall course structure. If constructed by teaching teams together and regularly, a “map” can highlight where various knowledge, skills and attributes are scaffolded and assessed throughout the course (Lawson, et al., 2015) and generate important quality enhancement discussions.

The importance of a teaching team approach is supported by the realisation that it is the mapping process which is more valuable than the product (Kelley, McAuley, et al., 2008). In addition, if shared with students, curriculum mapping can help them to appreciate the

relevance of their individual units and assessment to their overall learning goals. It can help them to see how each unit in their course is related and integrated. It can provide them with a “road map” to where they are headed which may help to motivate some students to learn (Hamdy, 2006).

A curriculum map can be static or dynamic (Harden, 2001). Given curriculum and assessment must be adapted over time to fit with “industry” needs and teaching staff may come and go, most curricula suffer from “curriculum drift”. Underpinned by the literature (Lawson, et al., 2013), Lawson attempted to address this issue by designing a Curriculum Design Workbench (CDW) (Lawson, 2015). The CDW incorporates course level rubrics which can help to prevent such drift. The rubrics can ensure key knowledge, skills and attributes and their development are not undermined by the natural changes in curriculum that take place over time. Whilst a new concept, a course level rubric is useful for AoL. Their use can support educators to scaffold students’ development of each course level learning outcome course-wide from introductory, intermediate through to graduate level (Lawson, 2014).

The international pharmacy education literature reported on the use of curriculum mapping of competency standards for accreditation requirements. Examples included an electronic curriculum database at the University of Oklahoma College of Pharmacy which acted as a staff sharing centre for information about assessment items and curriculum (Conway, Medina, Letassy, & Britton, 2011). Plaza et al. (2007) had their students and educators consider the (competency) domain coverage of their pharmacy programme and utilised topographical maps to present the data.

Portfolio assessment is another useful way for students to integrate their learning course-wide and over time whilst also engaging them in self-assessment. Portfolio assessment is not new - in fact, in 1994 John Biggs described its use with his Bachelor of Education students who

were studying educational psychology. Biggs' use of portfolio assessment in this context provided an exemplar of outcomes based assessment. Biggs has since attributed that portfolio assessment to the development of "constructive alignment" (Biggs & Tang, 2011, p. 96).

Portfolio and e-Portfolio are increasingly being utilised by educators in higher education to facilitate reflection and self-assessment practices amongst students (Kardos, Cook, Butson, & Kardos, 2009; Oliver, von Konsky, Jones, Ferns, & Tucker, 2009; Oliver & Whelan, 2011; Shroff, Trent, & Ng, 2013; von Konsky & Oliver, 2012). Portfolio can also provide a mechanism for students to collate evidence of their learning course-wide. In addition they can support students to integrate their learning, evidence their learning and reflect on this learning from multiple contexts and from multiple points in time (Oliver & Whelan, 2011; Walton, Gardner, & Aleksejuniene, 2015). With the increased use of e-Portfolio in higher education, more is being realised about their ability to foster student centred learning approaches (Chen, 2015; Chen, Grocott, & Kehoe, 2016; Kahn, 2014; Kehoe & Goudzwaard, 2015; Oliver & Whelan, 2011; Reese & Levy, 2009). Kehoe (2015) urges us to consider the merits of e-Portfolio and its role in encouraging students to experience, engage and evidence their learning. The work of Petit et al. (2008) highlights that it is not just the content but also the way it is delivered that makes it possible to challenge our students to acquire competencies in self-reflection and self-assessment from as early as first year. Student portfolios and the artefacts within are commonly used as evidence of student attainment of course learning outcome or standards, useful for course accreditation.

The pharmacy education literature reported on the use of portfolio assessment for the integration of students' knowledge, skills and attributes. In Belgium and the United Kingdom (UK) portfolio assessment was utilised to drive student centred learning approaches. It had dual purpose, in that it was also employed to evidence student outcomes for the accreditation of their courses (McMahon & Henman, 2007; Petit, Foriers, & Rombaut, 2008). In the UK

students were also invited to utilise their profession's General Level Competency Framework (McMahon & Henman, 2007) in their portfolio as a checklist for their progress. For Hill, Delafuente, Sicat & Kirkwood (2006) competency-based education and assessment in the form of a student competence checklist provided their school with data that can be used to evaluate the effectiveness of curriculum in preparing students for practice and provide data for re-accreditation.

The literature and the findings from the surveys and interviews informed the design of the educational intervention and provide the justification for the need for the intervention.

The TLR components included the NCS, Miller's pyramid of clinical competence and the traffic light scale. Its delivery took advantage of technology enhanced learning techniques and employed self-assessment to engage students in their learning now and in the future.

Fitting with the definition of self-assessment provided by Epstein et al. (2008), students interpreted data about their own performance in their assessments and compared it to an explicit standard containing three elements; NCS, Miller's pyramid and the traffic light scale. Each of these components are now discussed in detail.

NCS

The NCS were utilised in the educational intervention for two purposes; curriculum mapping by educators and for self-assessment by participating students. The NCS are discussed in greater detail in 1.1 – Pharmacy Profession. Of relevance to the TLR educational intervention the 2010 version of the NCS contains eight competency domains and thirty three standards. To support educators to complete the required curriculum mapping for the TLR a customised curriculum mapping tool was designed. Its design was informed by discussions with educational designers within the sector and the literature (Harden, 2001; Harden & Stamper, 1999; Lawson, et al., 2013; Oliver, 2010; Oliver, et al., 2007; Plaza, et al., 2007). As per Appendix 4, in Semester 1 two independent researchers (RN, JT) mapped the NCS to the

existing curriculum according to the assessment information in the unit outlines. Where the researchers were unsure, the unit co-ordinators were also contacted. Multiple rounds of discussion and repeated mapping occurred until consensus was met between RN & JT. In Semester 2, RN sat with each unit co-ordinator to map their assessment items to each NCS. To facilitate accurate self-assessment and to enable students to appreciate their progress it was important that students had clearly defined standards (Andrade & Du, 2005; Biggs & Tang, 2011; Sargeant, et al., 2011), with which they were familiar (Falchikov & Boud, 1989). The NCS provided students and educators with a set of clearly defined standards, also capable of supporting a ‘needs based’ approach to curriculum design and renewal (Anderson, et al., 2012).

Miller’s pyramid

As the NCS describe an “entry level” pharmacist’s knowledge, skills and attributes situated in practice, it was necessary to ‘scale’ the NCS to make them applicable to student pharmacists and their educators in the education context. Miller’s pyramid was used for this purpose. The base of Miller’s pyramid represents knowledge components of competence; knows (basic facts) followed by knows how (applied knowledge), shows how (simulated performance), and then does (in practice setting) (Wass, Van der Vleuten, Shatzer, & Jones, 2001).

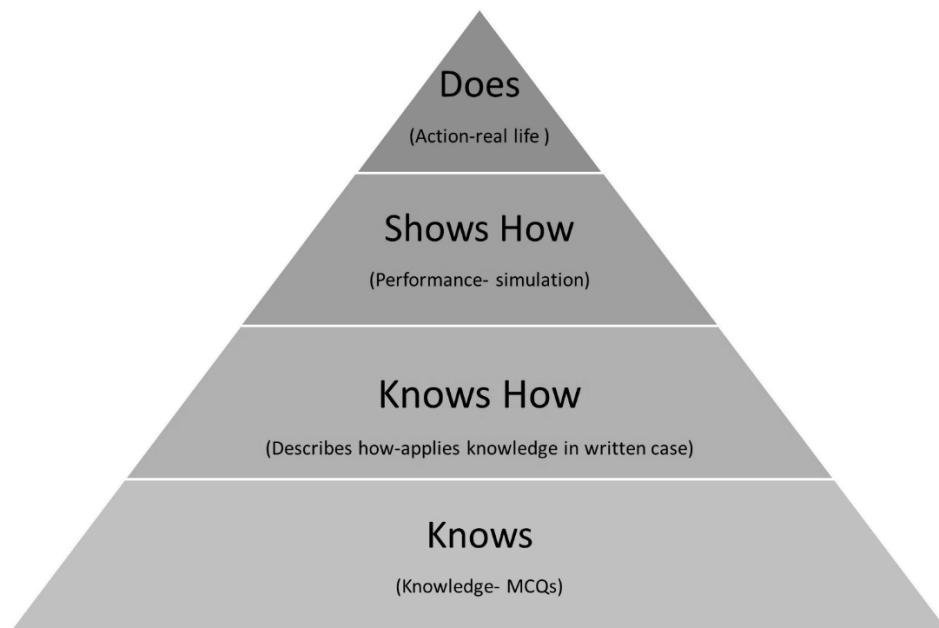


Figure 2. Miller's Pyramid Adapted Miller G (1990 p. S63) & Wass, et al., 2001. p. 946.

Educators may be more comfortable with taxonomies such as Blooms (Krathwohl, 2002) and SOLO (Biggs & Collis, 1982) or newer frameworks such as the Dreyfus Model for medical competence (ten Cate, Snell, & Carraccio, 2010). However, Miller's pyramid is a simple conceptual model for clinical competence (Miller, 1990). Miller's pyramid was first utilised in medical education to describe the interplay between knowledge and application of knowledge in the delivery of professional services by physicians (Miller, 1990). At the time Miller bemoaned the fact that the knowledge base (knows) seemed to dominate the assessment of medical students. He recognised the importance of medical students being assessed for their ability to apply their knowledge in the practice setting (does). Since, Miller's pyramid has been utilised internationally in medical and pharmacy education (Kelley, Stanke, Rabi, Kuba, & Janke, 2011; Van Der Vleuten & Schuwirth, 2005; Wass, et al., 2001). When Miller's pyramid is combined with the NCS a "competence continuum" can be communicated to Australian pharmacy students. The TLR prompted students to reflect on the level of performance required of the assessment tasks they had completed in the prior semester.

Traffic light scale

The traffic light scale provides a simple and familiar scale for self-assessment where Green corresponds with okay, Orange corresponds with needs attention and Red corresponds with needs urgent attention. Traditionally the ‘traffic light’ scale has been utilised in project management (Hamilton, Byatt, & Hodgkinson, 2011), whereby workplaces utilise the RAG (red, amber, green) status report to monitor and detect issues in project progression. Others in the literature report its use with primary school aged children in ‘assessment for learning’ contexts specifically for the purpose of self and peer assessment (Hodgson & Pyle, 2010). The scale is readily recognised and easily understood rendering it a useful tool for student self-assessment or self-reflection activities. Students participating in the TLR were instructed to interpret Green as ‘okay or on track’, Orange as ‘requires a revisit of the relevant NCS’ and Red if the student felt this ‘NCS required their urgent attention’. To mirror the student self-assessment the TLR converted assessed grades obtained from their educators from percentages and traditional marks (High Distinction (HD) 80-100%, Distinction (D) 70-79%, Credit (CR) 60-69%, Pass (P) 50-59% and Fail (0-49%)) to the traffic light scale. Queries were written into the customised database which converted all HD, D and CR grades to a Green, a Pass to an Orange and a Fail to a Red. Students self-assessed their performance against the NCS on the traffic light scale, this is referred to in the literature as course-level grade prediction (Boud, et al., 2013; Falchikov & Boud, 1989; Pintrich, 1995; Zimmerman & Schunk, 2001).

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Chapter 2. Systematised Review of the Pharmacy Education Literature; International use of Competency Standards

Introduction

Chronologically, the literature review described in this chapter was carried out at the commencement of the PhD candidate's research project. It provided the foundation for the surveys, educator interviews and finally the design elements of the TLR. Prior to this review there had been no published systematised reviews of the pharmacy education literature to describe the use of the competency standards in the course-wide design of curriculum. In fact, little had been published in the international pharmacy education literature on competency based assessment prior to 2000. There were no Australian reports of course-wide use of the NCS, although there were some papers identified which described the use of competency standards for isolated uses in a curriculum such as in experiential placements (Owen & Stupans, 2010). These examples were not included in the reported review papers as they did not fulfil the review criteria of being course-wide in their scope. The findings from the systematised review served several important functions;

1. It provided a useful background and foundation on the currents of pharmacy education and application of competency standards both internationally and within Australia.
2. It justified the need for further research in pharmacy education in Australia due to an identified gap in the literature.
3. It informed the design and delivery of subsequent surveys and interviews for use with to Australian pharmacy stakeholders including students, interns, educators and pharmacists.
4. It stimulated ideas and provided an evidence base for the design of the TLR.

Research Question

How are Competency Standards utilised program-wide to design pharmacy education internationally?

Embedded Publication (Paper 1); An international review of the use of competency standards in undergraduate pharmacy education

All of the research contained within this Chapter has been published as;

Nash, R., Chalmers, L., Brown, N., Jackson, S., & Peterson, G. (2015). An international review of program wide use of competency standards in pharmacy education. Pharmacy Education Journal 15(1), 131-141.

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Chapter 3. Australian Pharmacy Education and Practice; current familiarity, perceived relevance and use of NCS

Introduction

The following chapter describes the results from five surveys conducted with members of the Australian pharmacy community to determine the current familiarity and use of the NCS. The members included students, intern pharmacists, pharmacy educators, registered pharmacists and pharmacy preceptors. The survey questions which were included in each group's survey are provided in Appendix 1. The surveys were delivered online via Limewire survey. Each survey was designed specifically for its target population. There were common questions asked across all five groups, however there were additional relevant questions asked of each individual group. The common questions were combined and became the focus for the analysis presented in this chapter. Due to poor response rates from the preceptor pharmacists and given that by definition a preceptor has to be a registered pharmacist, their responses were combined with the registered pharmacists' responses. Prior to this work the literature did not provide a detailed account of the current familiarity, perceived relevance and use of NCS in Australia. This research has implications for all members of the pharmacy community, particularly pharmacy educators.

Research Questions

What is the current familiarity, perceived relevance and use of the National Competency Standards for Pharmacists in Australia for pharmacists, students and educators? What are the implications for pharmacy education?

Embedded Publication (Paper 2); Knowledge, use and perceived relevance of a profession's Competency Standards; Implications for Pharmacy Education.

All of the research contained within this Chapter has been published in the International Journal of Pharmacy Practice as early view 21/4/2016.

Nash, R., Chalmers, L., Stupans, I., & Brown, N. (2016). Knowledge, use and perceived relevance of a profession's Competency Standards; Implications for Pharmacy Education. [Early View 21/04/2016]. International Journal of Pharmacy Practice. DOI:10.1111/ijpp.12267

Acknowledgements: Thank you to all the pharmacists, preceptors, interns, students and pharmacy educators who shared their views and knowledge through completion of the survey reported on in this paper.

3.1 Abstract

Objectives: To determine the extent of use and perceived relevance of the National Competency Standards Framework for Pharmacists in Australia (NCS). Based on these findings, to suggest approaches for the enhancement of pharmacy education for the profession locally and globally.

Methods: Convenience sampling techniques were employed between November 2013 and June 2014 in conducting an online survey with Australian pharmacy students, interns, pharmacists and educators.

Key Findings: Data from 527 participants were included in the final analysis. Fewer students (52%, 96/183) and interns (78%, 69/88) knew the NCS framing pharmacy practice compared with pharmacists (86%, 115/134). Despite knowledge that the NCS existed most participants reported poor familiarity with and use of the NCS. Registered pharmacists reported annual use but not for Continuing Professional Development (CPD) plans or annual re-registration requirements. Respondents reported that practical use of NCS (e.g. mentoring interns) increased their use for personal needs. Some participants suggested regular instruction on self-assessment skills development would enhance meaningful use of the NCS.

Conclusion: Despite self-assessment against NCS being mandated annually, Australia's practising pharmacists provided explanations for why this is not common in practice. The barriers provided by respondents are interconnected; their enablers are practical solutions to each barrier. The findings reinforce the notion that student pharmacists must have their competency standards, life-long learning and self-assessment skills embedded into their university curriculum to ensure a strong foundation for practice. The opportunity offered by periodic renewal of standards must prompt regular profession-wide evaluation of its education to practice nexus. Insights and author recommendations are portable to the pharmacy profession globally.

Keywords: Competency Standards, Pharmacy, Education, Self-Assessment.

3.2 Introduction

'Competence is generally taken to mean that an individual possesses the required knowledge, skills and attributes sufficient to successfully and consistently perform a specific function or task to a desired standard....Inherent to the concept of competence is the inference of assessment of performance in a given circumstance against a specified external measure.' (National Competency Standards Framework for Pharmacists in Australia, 2010, pp. 4-5).

The requisite knowledge and skills of healthcare professionals require ongoing maintenance as knowledge outdates as quickly as it is acquired. The Australian pharmacist's external measure, The National Competency Standards Framework for Pharmacists in Australia (NCS), has a number of proposed uses (Figure 5.)



Figure 5. Applications of the National Competency Standards Framework for Pharmacists in Australia 2010

Adapted with permission from (National Competency Standards Framework for Pharmacists in Australia, 2010, pp. 8)

The NCS are described as being important for annual re-registration, pharmacist self-assessment of competence and continuing professional development (CPD) (National Competency Standards Framework for Pharmacists in Australia, 2010). All require individual practitioners to reflect on their practice and assess their knowledge and skills, identify learning needs, create a personal learning plan, implement the learning plan, evaluate its effectiveness and then plan in relation to their practice (Rouse, 2004). Practice is defined by the Australian Health Professionals Regulation Agency (AHPRA)

‘as any role whether remunerated or not in which the individual uses their skills and knowledge as a pharmacist in their profession....practice is not restricted to the provision of direct care. It also includes working in a direct non-clinical relationship with clients; working in management, administration, education, research, advisory, regulatory or policy development roles.’ (Pharmacy Board of Australia AHPRA, 2010a, pp. 1)

Australian pharmacists hold national registration with the Pharmacy Board of Australia under AHPRA and there are a number of professional bodies that provide CPD. The Australian Pharmacy Council accredits pharmacy education providers. Following graduation Australian graduates undertake an internship under the supervision of a preceptor.

Guidance on CPD provided by the International Pharmaceutical Federation (FIP) (International Pharmaceutical Federation., 2002) and health professional education circles (Eva & Regehr, 2008) recognises self-assessment as key to CPD cycles. Furthermore the Pharmacy Board of Australia mandates by law that pharmacists self-assess their individual needs with specific reference to the NCS (Pharmacy Board of Australia AHPRA, 2010a). Rouse defines CPD as ongoing, self-directed learning (SDL), structured, outcomes focused cycles of learning and personal improvement (Rouse, 2004). This definition and Knowles’ definition of SDL (Knowles, 1975) are synonymous and emphasise the responsibility of the individual (International Pharmaceutical Federation., 2002). CPD is moving towards

‘greater emphasis on self-direction, self-assessment of learning needs and goals, direct relevance of the learning to the practitioner’s daily practice, and practice change.’
(Tran, Tofade, Thakkar, & Rouse, 2014 pg. 4).

The renewed NCS will be released in 2016, (Australian Hospitals and Healthcare Association., 2014) providing an opportunity to build professional capability and systematically optimise the entire spectrum of Pharmacy Education practices from student through to advanced practice. Observing pharmacy globally for optimal use of competency frameworks and interpretations of life-long learning and CPD (Tran, et al., 2014) could inform local practices. Globally, since the introduction of competence in the 1960s, philosophical debates and controversies have surrounded competence frameworks for the health workforce, including pharmacists (Australian Hospitals and Healthcare Association., 2014; Brownie, 2011a, 2011b). There is strong evidence to support their use in the professional development of pharmacists (Hill, Delafuente, Sicat, & Kirkwood, 2006; Mills, Farmer, Bates, Davies, & Webb, 2008). Confusion caused by inconsistencies in terminology and definitions of competence (Brownie, 2011a; Nash, Chalmers, Brown, Jackson, & Peterson, 2015) and the challenges to assessment of competence (a complex construct) (Biggs & Tang, 2007; Epstein & Hundert, 2002; Falchikov, 2005; Miller, 1990; Van Der Vleuten & Schuwirth, 2005; Yeates, O'Neill, Mann, & Eva, 2013) in both the classroom and practice setting require increased attention to enable this reconciliation. The International Pharmaceutical Federation contributes a global framework (International Pharmaceutical Federation Pharmacy Education Taskforce, 2012) and guidelines (International Pharmaceutical Federation, 2000, 2009; International Pharmaceutical Federation Council, 2011) to support pharmacists and educators to optimise their local frameworks. Requirements for maintenance of competence differ from country to country. In the United States of America, pharmacists subscribe to credentialing and privileging with periodic peer review for evaluation (Council on Credentialing in Pharmacy, 2014). Gallagher (2010) describes a

process of scrutiny by a fitness to practice committee for pharmacists in Ireland. New Zealand pharmacists engage in peer review (Pharmacy Council of New Zealand., 2012) as are those in Canada where third party assessment of competence is also mandated (Winslade, Tamblyn, Taylor, Schuwirth, & et al., 2007). Meanwhile, Australian and United Kingdom pharmacists evidence CPD points (Pharmacy Board of Australia AHPRA, 2010b) and are subject to random audit of CPD activities.

Given Australian Pharmacy mandates by law (Pharmacy Board of Australia AHPRA, 2010b) the use of the NCS, this paper aims to provide insight into the extent of use and perceived relevance of the NCS by its key stakeholders in Australia, most notably its pharmacists. In making their recommendations the authors draw on the findings of the survey reported on here, the international pharmacy education literature, (Nash, et al., 2015) interviews with Australian pharmacy educators (Nash, Chalmers, Stupans, & Brown, 2015), and an undergraduate NCS educational intervention (Traffic Light Report) (Nash, Chalmers, Stupans, & Brown 2016 IN PRESS).

The authors seek to provide an account of their lessons learnt, portable to the local and global pharmacy community, intended to enhance the use of competence frameworks and pharmacy education.

3.3 Methods

A cross-sectional online survey was utilised to invite key stakeholders in the Australian pharmacy profession (students, interns, educators and registered pharmacists) to outline their current use, knowledge and perceived relevance of the NCS. The study utilised a pragmatist frame and concurrent strategy of enquiry (Creswell, 2013), consistent with the research approach the surveys included quantitative and qualitative responses to capture multiple viewpoints of the profession. The surveys are available in Appendix 1. The survey questions

were designed using well known survey methodology described by Salant & Dillman; Dillman and Boynton & Greenhalgh (Boynton & Greenhalgh, 2004; Boynton, Wood, & Greenhalgh, 2004; Dillman, 1978; Kelley, Clark, Brown, & Sitzia, 2003; Rosenthal & Rosnow, 1991; Salant & Dillman, 1994). The surveys included two sections - demographics and survey questions. The questions combined Likert scales and open and closed questions to investigate NCS; familiarity, perceived relevance, frequency of use, format, barriers and enablers, classified uses and application in CPD. Face validation was undertaken using a sample of pharmacists who provided feedback on the wording and the survey was opened in Limewire Survey between November 2013 and June 2014.

Prior to the distribution of the online surveys the authors conducted qualitative interviews with nine Pharmacy Educators (PE), five Heads of School (HoS) and eight intern training program co-ordinators (ITPC) (Nash, et al., 2015). Using a snowball and convenience sampling technique (Creswell, 2013) the interviewed HoS, PE and ITPC were then invited to distribute emails containing the online survey links to their networks. The email included the survey links specific to each stakeholder group e.g. HoS and PE were sent emails to forward to pharmacy educators and students, ITPC were sent emails for preceptor pharmacists and interns. Whilst the survey questions were respondent group specific eleven common questions were asked of all participant groups. For analyses purposes the preceptor data (n=10) were combined with the pharmacists, in the acknowledgement that all preceptors must be registered pharmacists. Australian pharmacy organisations distributed the survey link via industry newsletters and social networks. Business cards with the survey links were distributed to delegates at a 2013 pharmacy conference (Refer to Appendix 1). As a result of the distribution strategy, it is difficult to determine an exact study population. Based on information provided by HoS, PE and ITPCs (Nash, et al., 2015) combined with recent estimates from Health Workforce Australia (HWA)(Health Workforce Australia., 2014) and

AHPRA documentation (Pharmacy Board of Australia, 2014), total eligible populations are estimated as 26,100 general registration pharmacists, 1700 provisional pharmacists (interns), 4800 pharmacy students and 250 pharmacy educators.

The quantitative data was analysed using SPSS software (Version 22); non-parametric tests were applied to determine correlation and statistically significant findings. Utilising principles of thematic analysis as outlined by Braun and Clarke (2006) RN arranged comments into themes. The coding rules and coding were checked by a second analyst.

Minimal risk ethics approval was obtained from the Tasmanian Social Sciences Human Research Ethics Committee (reference: H13591).

Data from incomplete surveys were retained for analysis if demographics were provided and at least five questions answered.

3.4 Results

Of the 660 online survey responses, 413 were full responses and 247 were incomplete; 527 participants were included in the final analysis. The sample represents approximately 1% of registered Australian pharmacists (158), 7% of provisional (intern) pharmacists (119), 5% of students enrolled in Bachelor and Masters programs in Australia (224) and 11% of Australian pharmacy educators (26).

Participant demographics are provided in Table 8.

Table 8. Survey participant demographics

	Students	Interns	Pharmacist~	Educator	Total/ %
Responses					
Full	179	85	128	21	413
Incomplete	118	60	56	13	247
Included in analysis	224 (42%)	119 (23%)	158 (30%)	26 (5%)	527
State (study/workplace) (n=496)					
TAS	74	5	49	7	135 (25.6%)
NSW	70	26	25	6	127 (24.1%)
QLD	31	57	37	4	129 (24.5%)
Other	32	26	40	7	105 (21.2%)
Aligned to a Professional Organisation which offers accredited CPD (n=527)					
Yes	219	114	145	1	479 (90.9%)
No	5	5	13	25	48 (9.1%)
Area of Practice (n=173)					
Academia			3	13	16 (9.2%)
Hospital			20	3	23 (13.3%)
Community			125	8	133 (76.9%)
Accredited Pharmacist			34	6	40 (23.1%)
Other^			18	3	21 (12.1%)
Currently Practising (n=183)					
			153	20	173 (94.5%)
Years in Practice (n=181)					
1-2yrs			21	2	23 (12.7%)
3-5yrs			26	2	28 (15.5%)
6-10yrs			30	4	34 (18.8%)
11-15yrs			18	3	21 (11.6%)
16-30yrs			34	9	43 (23.8%)
31yrs plus			27	5	32 (17.7%)
Currently Registered (n=183)					
			156	20	176 (96.2%)
Hours per week paid/actual (n=178)					
1-10hrs			6	2	8 (4.5%)
10-30hrs			32	18	50 (28.1%)
30-40hrs			64	4	68 (38.2%)
40hrs plus			51	1	52 (29.2%)

Changes in denominator (n) are due to some respondents answering some questions and not others.

~Pharmacists include pharmacists and preceptors.

^Other includes; Drug & Alcohol Services, Practice Support, Administration role, Prison Service, Clinical Services, Government, Education (National Prescribing Service Facilitator), Unemployed, Rural, General Practitioner, Committee Member, Pharmaceutical Industry.

The survey results are reported under knowledge, use and perceived relevance as described by the participants.

Knowledge

Respondents provided a variety of definitions for the NCS. Most reflected an understanding that they are a guideline for individuals to assess their fitness to practice, to ensure patient safety. Some respondents reported limited prior exposure to the NCS, poor understanding of its purpose or difficulty appreciating its usefulness. This response reflects on the link between NCS in practice and in their university education;

‘Perhaps (NCS) not emphasised enough though, not until late in course (either) from memory.’ (Pharmacist77 28yo, F, VIC - comment from online survey)

In Figure 6, participants’ self-reported knowledge of the NCS is presented alongside familiarity. Most respondents self-reported being not at all familiar (32%, 137/407) or not very familiar (46%, 196/407) with the NCS.

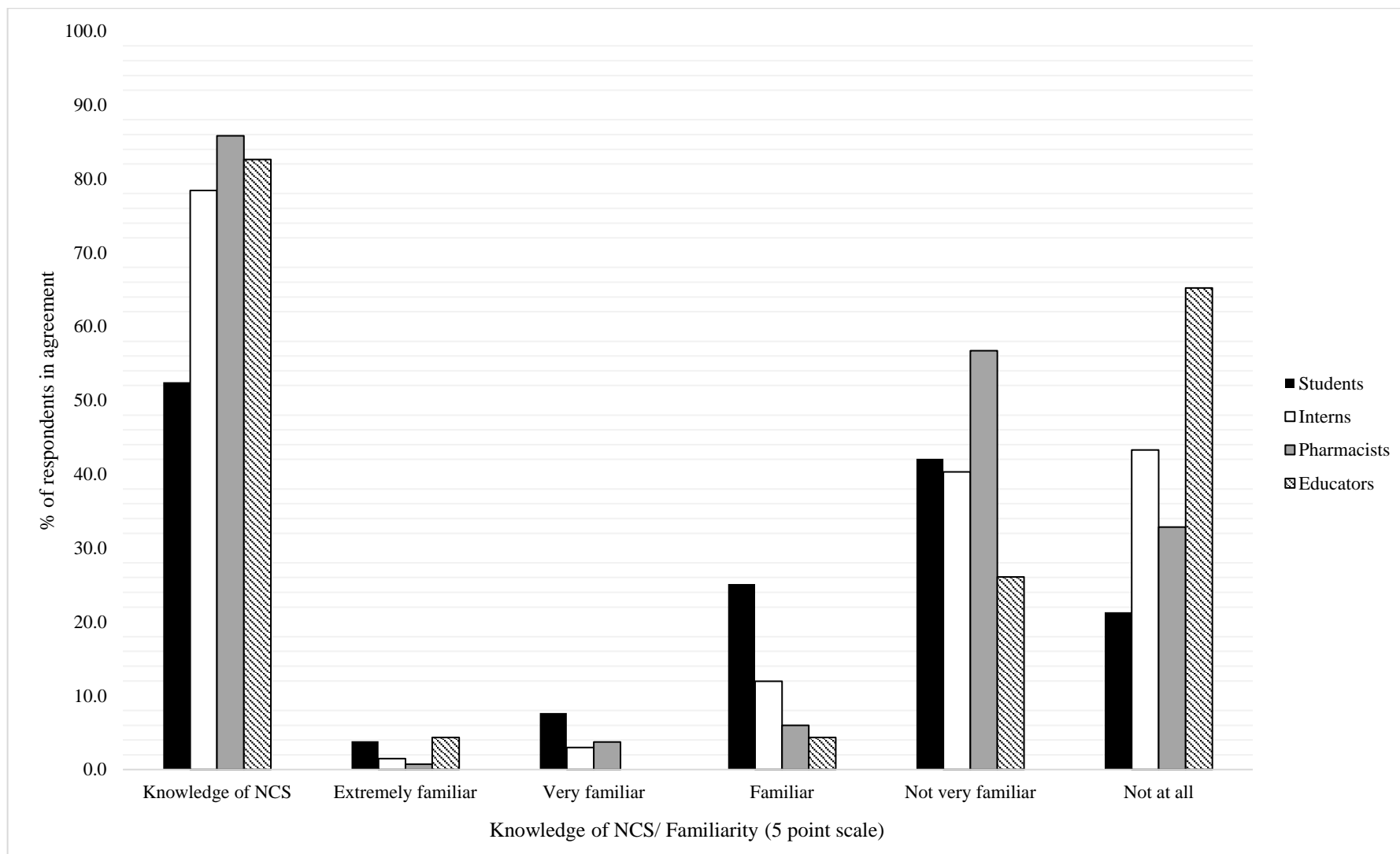


Figure 6. Respondents' self- reported knowledge alongside familiarity with NCS by group

Use

Between 2012 and 2013 a statistically significantly greater proportion of interns (90%, 60/67) and pharmacists (84%, 87/104) accessed the NCS document compared to students (56%, 90/160) (both $p < 0.001$). Of the 23 educators who responded, 16 referred to the NCS in their teaching and 10 reported their students were familiar with the NCS. Pharmacists in preceptor roles reported use with their interns;

'(NCS) post-dates my time as an intern. But as preceptor very aware of it as part of the current intern program.' (Pharmacist55 48yo, F, TAS - comment from online survey)

Overall the majority of respondents reported using the NCS once (30%, 72/236) or twice (31%, 74/236) a year. The majority of pharmacists reported that they did not utilise NCS for renewal of annual registration (57%, 61/107) or for planning CPD (77%, 82/107).

Fifteen percent of students (27/182) self-reported using the NCS currently to chart their own progress. Twelve percent had utilised the Experiential Placements Self-Assessment tool (Owen, 2011) (which contains the NCS) and 70% (127/180) of students agreed that the NCS was a reference point for academics in the development of their curriculum.

Perceived Relevance

Whilst the majority of students (95%, 127/133) and interns (98%, 64/65) agreed that NCS were relevant to them now, pharmacists were less convinced of their relevance (85%, 88/104) (both $p = 0.008$). Of the 104 pharmacists who responded, 83.1% felt the NCS will be relevant to them in the future.

Thematic analyses revealed key barriers and enablers. The key barriers (circles) and enablers (rectangles) articulated by the respondents are provided in Figure 7. The figure acknowledges the interconnectedness of the barriers and provides the participant suggested enablers to overcome the perceived barriers.

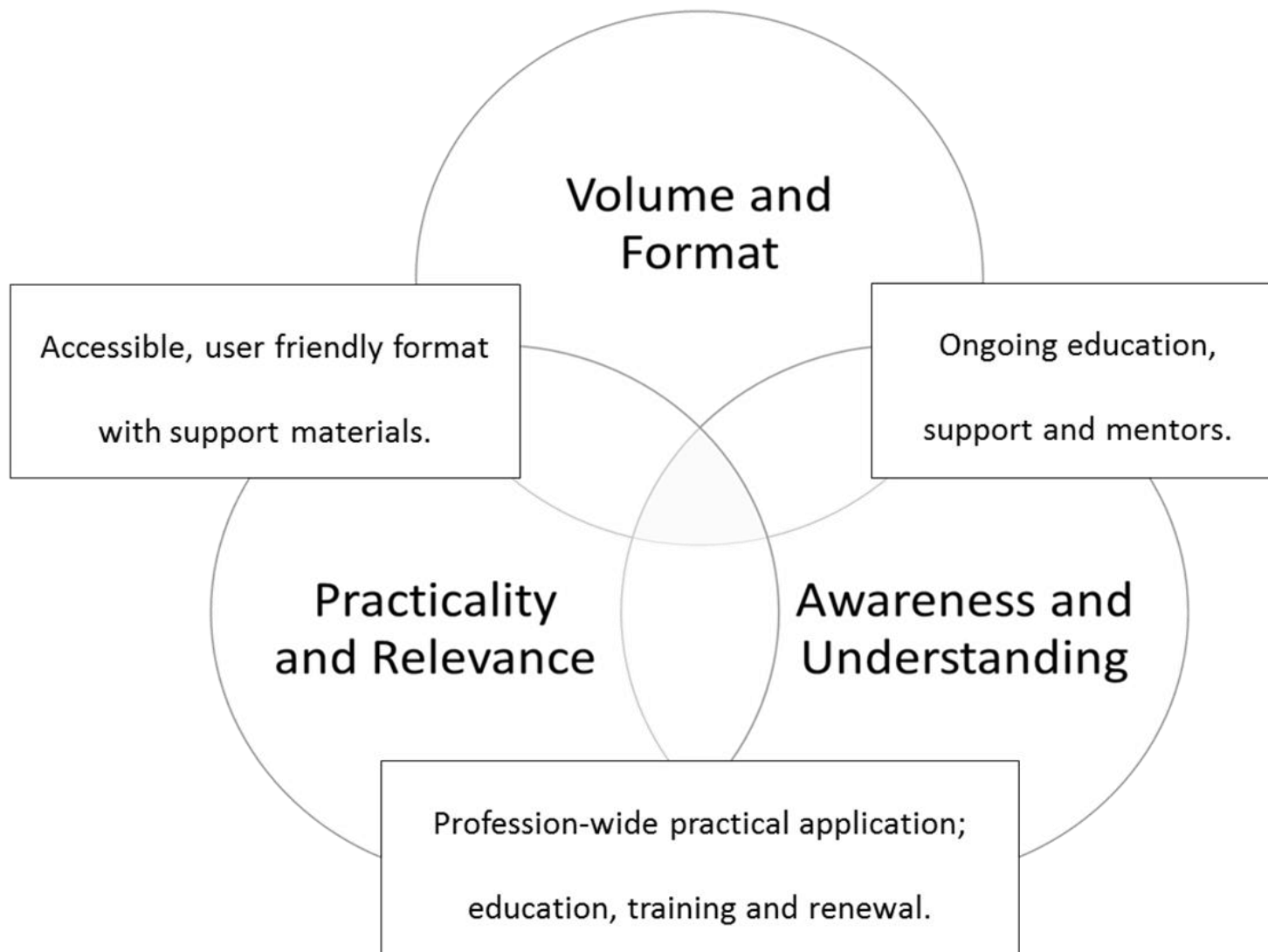


Figure 7. Themes derived from respondents reported barriers and enablers to use of NCS

Barriers provided by respondents (pharmacists and educators) included the current format of the document and large number of standards; poor awareness of and familiarity with the NCS; and lack of perceived relevance and practicality in practice. Example statements are provided in Table 9.

The respondents also offered enablers to the use of the NCS (Table 10). Some suggested relevant and practical application in an individual pharmacist's context (particularly in a mentor role) led to increased familiarity and therefore use in their own CPD. Pharmacists suggested that ongoing support in the form of professional development, education workshops and seminars with specific focus on how to use the NCS to frame CPD would be an enabler to their use.

Table 9. Barriers to use of National Competency Standards Framework for Pharmacists in Australia, 2010 (NCS)
(National Competency Standards Framework for Pharmacists in Australia, 2010)

Theme	Coding	Example comments
Volume & Format	<i>Volume/ Format Overwhelmed by pharmacy resources-guidelines. Educational/ TLO aligned Measurable teaching tool/ Examinable</i>	<p><i>"Very long winded document, too long and ambiguous to be a truly useful resource for the profession." (Pharmacist102, 52yo, M, WA)</i></p> <p><i>"Breath of the standards. Way too convoluted." (Pharmacist (preceptor)15 Proprietor, Masters in Pharmacy, WA)</i></p> <p><i>"Breakdown of standards - becomes difficult to link some features of CPD to attributes of the competency standards." (Pharmacist107, 24yo, F, QLD).</i></p> <p><i>"Students find large documents laborious to refer to or find during tutorials....By 4th year, most students have a vague awareness of "that document" but there are so many of "those documents" that I really don't think they actually remember it, or its name. But they know that PSA has "a lot of stuff." (Educator24, Board examiner, QLD)</i></p> <p><i>"Length - tedious to read through. Lack of awareness by other pharmacists. Simply not used much in practice. Usually applied through learning programmes for pharmacy interns through the university or PSA." (Pharmacist (preceptor)20, B. Pharm Hons, SA)</i></p>
Awareness & Understanding	<i>Poor: Awareness Familiarity Understanding</i>	<p><i>"lack of awareness and understanding of the documents purpose." (Pharmacist20, 45yo, F, TAS)</i></p> <p><i>"I think the biggest barrier is that the students do not understand that by the end of their degree they will be health care professionals and need to refer to the standards all the time but they view the degree as education only and they are only concerned about their marks and for them Competency is the after- life (after graduating)." (Educator31, Teacher practitioner, Masters of Pharmacy, NSW)</i></p>
Practicality & Relevance	<i>Practical application Time poor practitioners Relevance/ applicability in daily practice Examinable*</i>	<p><i>"time constraints - may not always be relevant to everyday practice." (Pharmacist (preceptor)7, community and compounding pharmacist B. Pharm Hons, QLD)</i></p> <p><i>"Very few students are interested in this level of detail. While the standards describe what they need to know/be able to do they are not examinable per se. Therefore students are not interested in the details." (Educator18Academic, Pharmacy Board Examiner, B Pharm, PhD candidate, WA).</i></p> <p><i>"only refer to it because it is listed as a reference for my intern. Otherwise, most of it is common sense that shouldn't need to be "referred" to if in doubt." (Pharmacist (preceptor)18, B.Pharm, AACPA, GradDipEc, VIC).</i></p>

Table 10. Enablers to use of National Competency Standards Framework for Pharmacists in Australia, 2010 (NCS)

Theme	Coding	Example comments
Accessibility & Support Materials	Format Defined Measurable Framework Portfolio & CPD requirement Inclusion in CPD & CE	<p>"on-line version with easy search and links." (Pharmacist57, 64yo, F, NSW)</p> <p>"It allows the intern to have a measurable and achievable goal to work towards in their intern year." (Pharmacist(preceptor)11, Pharmacy Manager, B. Pharm QLD)</p> <p>"Portfolio for registration." (Pharmacist29, 30yo, F, TAS)</p> <p>"In uni we reference the standard with the activities we did in placement and so did CPD during intern year." (Pharmacist173, 24yo, F, NSW)</p> <p>"Listing in CPD activities. Listing in PSA codes & guidelines." (Pharmacist109, 52yo, M, QLD)</p>
Education & Support	Familiarity Support, Professional Development and ongoing education Learnt through application and regular application. Application as a mentor Improvement of Attitudes	<p>"previous exposure in training is vital." (Pharmacist158, 55yo, F, TAS)</p> <p>"local seminar on what they are, how they work, what they're for.." (Educator22, PhD, NT)</p> <p>"workshops, refreshment courses" (Pharmacist15, 28yo, M, TAS)</p> <p>"Request the Australian Pharmacist to include a module(s) in their continuing education section." (Pharmacist168, 51yo, M, TAS)</p> <p>"Keeping the teaching practice-focussed, constantly relating learning activities to practice." (Educator2, Educational Designer, NSW)</p> <p>"Having been a preceptor in the past has made me more familiar with the standards and more confident using them." (Pharmacist118, 31yo, F, TAS)</p> <p>"Students are made aware of the standards through their intern programmes." (Pharmacist (preceptor)20, B.Pharm Hons SA)</p> <p>"Attitude of mentor and intern is paramount." (Pharmacist(preceptor)6, Pharmacist, B.Pharm QLD)</p>
Practical Application	Mandate: Accreditation/ Re-accreditation requirement. Increase use in performance management. Importance for intern year/initial registration.	<p>"Reregistration requirement. Previous exposure in training and teaching, assessment and mentoring." (Pharmacist20, 45yo F, TAS)</p> <p>"Defined measurable framework for use in rehabilitation mentoring." (Pharmacist22, 45yo,F, TAS)</p> <p>"Should refer to them in staff meetings, when training students, refer to them in performance reviews." (Pharmacist139, 59yo, F, NSW)</p> <p>"Explaining that this (NCS) is what they are being benchmarked against assists them (students) understanding why we refer to the standards." (Educator18, Pharmacy Board Examiner, B. Pharm, PhD candidate, WA)</p> <p>"Importance for intern year, and measures of practice competence for clinical placement - if it's assessable it's important to students." (Educator5, Lecturer, B.Pharm, GDip, NT)</p>

3.5 Discussion

The results of this study suggest that familiarity with and the use of the NCS across the entire profession need attention. Whilst participants could describe their purpose, familiarity was poor and use was sub-optimal. Most respondents who had accessed the NCS document had only done so once or twice yearly, however only half the students had accessed the NCS. Pharmacists – those to whom the NCS are most applicable – were least convinced of their relevance. Respondents offered a number of barriers and enablers to the use of the NCS in their current form.

The findings of this study have implication for all health practitioners internationally. Although limited by low response rates to some questions and potential bias (respondents may represent more professionally motivated individuals), the lessons learnt (Table 11) are portable to ensure optimisation of the renewal of local competency standards, education practices for development of skills essential for life-long learning and ongoing CPD refreshers for professionals. Other continents and professions may be interested in repeating this work as a comparison.

Each aspect of the research question; knowledge, use, perceived relevance is now considered in light of current international literature with education solutions as a focus.

Educators and students provide a logical starting point given student knowledge of the NCS was poorest and has the greatest room for improvement. Importantly, *‘students should be able to relate what is being studied to the competencies that will be needed in the workplace.’* (Eriksson, Höglund, Thomé, & Edgren, 2012, p. 1). The Australian Pharmacy Council (APC) requires evidence of student learning outcomes reflective of the NCS for course accreditation. It is interesting that whilst most pharmacy educators self-reported knowledge of the NCS, few of their students mirrored this finding. To attend to this we must ignite interest in the

NCS and make them practical and meaningful to educators and students in their context. The Traffic Light Report (TLR) piloted at the University of Tasmania in 2014 engaged students in self-assessment against the NCS and provided participants with a report (self-assessment and actual assessment) which gave them an indication of their progress along the “competence continuum”. The TLR is capable of increasing knowledge and acceptance of NCS and can build student confidence in self-assessment and self-directed learning skills (Nash, et al., 2016 IN REVIEW).

Pharmacists in preceptor roles stated that practical and repeated application of the NCS with their interns increased NCS use in their own CPD. The recent success of mentor models in NZ (Pharmacy Council of New Zealand., 2012) and Canada (Austin, Marini, Nora, & Croteau, 2005) or consideration of reverse mentoring programs for early career pharmacists (O'Reilly, 2010) may help to extend NCS knowledge and use beyond preceptors to the wider profession.

As described there are a number of potential uses for the NCS (Figure 5). One is in pharmacy curricular development. If the NCS are not introduced to students early in their course this may affect their familiarity and use once practitioners. Despite self-assessment against the NCS being mandated annually (Pharmacy Board of Australia AHPRA, 2010b), registered and practising pharmacists did not appear to be utilising the NCS for this purpose.

Consideration of the earlier introduction of life-long learning skills may ensure the habitual use and effective marriage of the NCS and CPD. Internationally integration of peer review (Austin, Marini, Glover, & Tabak, 2006), accredited learning facilitators (Pharmacy Council of New Zealand., 2012), mentor programs (Austin, et al., 2006; Royal Pharmaceutical Society., 2012), credentialing and privileging (Council on Credentialing in Pharmacy, 2014) and portfolio evidence (Tofade, Khandoobhai, & Leadon, 2012) have been successfully employed to encourage meaningful life-long learning practices.

Student pharmacist (Austin & Gregory, 2007) and registered practitioners' self-assessment abilities (Laaksonen, Bates, & Duggan, 2007; Pfleger, McHattie, Diack, McCaig, & Stewart, 2008) have been questioned. Pharmacists from this survey self-reported that they require ongoing instruction on self-assessment and have mixed feelings about it in their life-long learning practices. Following the 2010 introduction of mandated CPD for Australian pharmacists, Thompson and Nissen (Thompson, Nissen, & Hayward, 2013) found poor understanding on aspects of the CPD process, particularly self-directed learning, reflection and evaluation. This is consistent with our 2013 survey. There is evidence (Dopp, Moulton, Rouse, & Trewet, 2010) that provided with appropriate support, pharmacists can utilise CPD to maximise their life-long learning and professional development and maintain competence (knowledge, skills and attitudes). Consideration of one's standards is essential to this process; consistent with Rouse's (Rouse, 2004) description of CPD, Driesen et al. state

'systems that are based on CPD tend to have comprehensive competency standards, against which pharmacists have to compare their own level of competence as an integral part of the CPD process' (Driesen, Verbeke, Simoens, & Laekeman, 2007).

'Good tools can be used badly' (Fullan & Scott, 2009, p. 36). Unfortunately regardless of how well a competence framework is written it is useless if not sustainably embedded or effectively supported. Australian pharmacists' disengagement with their NCS could be a symptom of inconsistent use of competence terminology (Brownie, 2011a, 2011b; Nash, et al., 2015), self-regulated accreditation practices, inadequate use of mentor models for early career pharmacists and peer review of practice (Coombes et al., 2012), poor applicability and usability of NCS in pharmacy education (Brownie, 2011a; Nash, et al., 2015), issues with professional identity formation (Noble, Coombes, Nissen, Shaw, & Clavarino, 2015; Noble, Coombes, Shaw, Nissen, & Clavarino, 2014), and an accountability "tick and flick" audit mentality to maintaining competence rather than a responsible commitment to life-long learning. Our survey respondents suggested meaningful use of the NCS for life-long learning

could improve through focus on early intervention with students, periodic refreshers on self-assessment skills training as well as NCS awareness in the future. Logically, the use of a portfolio or e-Portfolio to store evidence of competence, from undergraduates through to advanced practitioners, should be arranged using the NCS domains as a framework to encourage systematic use and therefore relevance across the profession.

Consistent with the literature, survey participants' suggested enablers focussed on support to simplify the current format, optimise sustainable use of NCS; each provide a valuable remedy to each of the barriers. These barriers and enablers should be considered in the renewal of the NCS (Figure 7). Recent qualitative interviews with pharmacy educators (Nash, et al., 2015) conducted by the authors provide an interesting comparison; similar emergent themes include the mandated use of NCS (an enabler) but their volume and format in the education setting a barrier.

Table 11. Lessons for practice

- Educators must familiarise students (future health professionals) with their profession's competency standards alongside life-long learning skills development.
- Practitioner knowledge of a profession's competency standards does not translate to use.
- Pharmacists engaged with competency standards for practical use (e.g. mentor role, education) may be more inclined to utilise them in their own life-long learning.
- To ensure appropriate application in the practice setting, competency standards require advanced communication and dissemination strategies, complemented by a mentor model.
- Competency standards must be flexible, harmonized and describe a continuum so that all individuals across the pharmacy profession can apply them in their context.
- For initial education and ongoing registration requirements, education and assessment strategies need to be progressive and apply multiple methods (self, peer, portfolio assessments) at multiple time points.

3.6 Conclusions

Globally, considerable resources are invested in development and renewal of professional competency standards. They define minimum expectations to practitioners and fulfil multiple roles to protect the public. Once endorsed, standards must be disseminated, supported and evaluated to ensure they can be practically applied. Periodic renewal should prompt regular profession-wide evaluation of the education to practice nexus. To overcome disengagement we should begin with student pharmacists to ensure competency standards and self-assessment skills are embedded in curriculum together with authentic learning and assessment essential for life-long learning. These insights have global applicability to pharmacists and health professionals responsible for upholding patient safety through self-regulating their practitioner competence.

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Chapter 4. Australian Pharmacy Educators; Current use (barriers and enablers) to NCS

Introduction

The literature review in Chapter 2 characterises the current use of competency standards in pharmacy education internationally. This provides an appreciation of the barriers, enablers and lessons learnt in applying the competency standards in higher education course design and assessment. There were no reported Australian examples of course-wide use of the NCS in pharmacy education found in the literature review. In order to address this gap and to determine the current use of the NCS in the Australian pharmacy education context interviews with pharmacy educators were conducted. In direct response to the scarcity of Australian studies our interview findings provided insight into the practical application of the NCS in the education setting. The interview findings complement the online survey findings described in Chapter 3. The educators' interview responses provided the rich detail and greater understanding of the reasons why educators found the NCS difficult to apply in the education context.

The interview questions were developed with reference to the literature review findings. Prior to the study, it was believed that the qualitative interview findings would either 1) provide reassurance that the gap in the literature represented a failure to report on existing practices rather than a lack of such practices amongst Australian pharmacy educators or 2) confirm there was currently inadequate use of the NCS to inform Australian pharmacy education. I anticipated the interview findings would also provide insight into the barriers and enablers to the use of the NCS in the Australian pharmacy education context and further justify the need to design a competency based educational intervention for pharmacy students.

Research Question

What are the current barriers and enablers to the use of NCS in Australian Pharmacy Education?

Embedded Publication (Paper 3); A reciprocal relationship: informing a profession's competency standards.

Acknowledgements: The dedicated pharmacy educators who participated in these interviews.

All of the research contained within this Chapter has been published as;

Nash, R., Chalmers, L., Stupans, I., & Brown, N. (2015). A reciprocal relationship: informing a profession's competency standards. Paper presented (10/08/2015) at Higher Education Research and Development Society of Australasia (HERDSA), Melbourne, Australia.

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Chapter 5. Educational Intervention; Traffic Light Report

Introduction

This chapter introduces and examines the findings from the TLR educational intervention.

The TLR design was heavily informed by the findings discussed in Chapters 2, 3 and 4. The TLR sought to *'bring students to their profession and the profession to students through competency standards'*. This chapter examines the TLR design and findings from the educational intervention through three separate publications. The first (Paper 4 which is actually a book chapter) includes a general description of the TLR design methodology and the TLR's effect on NCS familiarity, the second (Paper 5) describes the TLR as a tool for self-assessment skills development and the third (Paper 6) suggests the TLR may present educators with a new technique for AoL.

The TLR (as shown in Appendix 3 and 4) combined three components; NCS, Miller's pyramid and a traffic light scale. Whilst each student completed their assessment against Miller's pyramid and the traffic light scale simultaneously, the two have been separated for analysis and intentionally described in this chapter using different terminology within the "visible skills" framework; self-assessment and self-reflection. Whilst reflection has been described as much broader than self-assessment (Boud, 1999), both are essential to ensure the effective application of the other (Sargeant, et al., 2010). In analysis the candidate discovered that by separating the data it became much easier to describe a complex process and also interrogate the data for greater meaning. Paper 5 refers to the activity the students carried out as self-assessment. This reflects that students were self-assessing their performance to nominate an anticipated assessed grade (grade prediction) on the traffic light scale. In contrast, Paper 6 refers to the activity the students carried out with the online TLR tool as

self-reflection. This term better described student reflection on the performance level (Miller's pyramid) that they thought they were being asked to perform at for each of their assessments in the previous semester.

As shown in the following chapter a student's self-assessment or reflection can provide rich data regarding their learnt curriculum. This is useful for educator insight and ensures the student voice is included in quality enhancement strategies. The TLR provided a mechanism to harness the student voice and educator expectations to provide an AoL opportunity.

The TLR provides a novel approach to student-centred learning, specifically through engaging the student in the practice of self-assessment and or reflection. Miller's pyramid provided a scale for the pharmacy profession's "competence continuum." This scaled continuum made it possible for students to relate to the NCS (written for entry level pharmacists) in their context. The candidate could not locate any other reported use of Miller's pyramid for student self-assessment or reflection in the literature. Whilst the TLR design itself is unique, the discoveries made through analysis of its collated and contrasted data provide evidence that the TLR could become a useful solution for curriculum design and AoL strategies in higher education.

Introducing a layer of complexity to the practice of self-assessment and an opportunity to practice informed judgement, the TLR system contrasted each student's self-assessment with their educators' perspective of the same curriculum and reported this information to the student in an individualised report (TLR). This made it possible to compare educators' summative assessment with individual student's self-assessment (grade prediction). The data is explored in this chapter to discuss the potential of the TLR as a tool to encourage students to practice self-assessment and also as a tool to measure self-assessment accuracy against their educator assessment.

Whilst access to Grade Point Average (GPA) was requested (as shown in Appendix 3) I resolved that this was unlikely to be a useful measure of the TLR effect due to the inability to control for many variables which can effect a student's GPA score.

Finally, as you will note in Appendix 3 students were asked to answer 13 additional questions at the conclusion of their self-assessment. This was carried out to establish consistency through confidence testing of each student's response against the NCS. These data were analysed but excluded from the final paper due to word limit concerns and the realisation this information did not add anything significant to the findings and argument.

Whilst the publications only provided an excerpt from a student's TLR, a complete example of a student's TLR is available in Appendix 4.

Chapters Influencing Traffic Light Report Design

Chapter 2. Systematised review findings inform TLR design

The Traffic Light Report (TLR) design outlined in this Chapter was specifically influenced by the findings in the systematised review of the literature. These have been discussed in detail in Section 1.8 – Components of the Traffic Light Report.

Chapter 3. Online survey findings inform TLR design

The discovery that there is poor knowledge, familiarity and use of the NCS amongst the profession provided impetus and justification for an educational intervention such as the TLR. The poor student familiarity provided additional incentive. Thus, the TLR design had to be useful to students in their current learning and address their future learning requirements (in other words be an example of sustainable assessment). Refer to Figure 9 for other factors which influenced the TLR design.

Chapter 4. Pharmacy educator interviews findings inform TLR design

During their interview, one pharmacy educator suggested '*articulate progression from introductory to final integrative assessment within the degrees*'. This statement would influence the TLR design and lead to the use of Miller's pyramid to scaffold the curriculum. In interview other educators highlighted the importance of presenting the NCS in a way that makes them relevant to the user in their current context, particularly through self-assessment. The interview findings influenced my decision to engage the students in an activity such as self-assessment. This was intended to maintain the relevance of the activity to students' current learning needs. Survey respondents and pharmacy educators in interviews highlighted that poor familiarity with NCS was profession wide and was one of the barriers to their use in the education setting. This also provided additional justification for the TLR and its place in the education setting. The candidate anticipates that in time student familiarity may have a backwash effect and lead to increased familiarity profession wide.

Research Questions

Can the Traffic Light Report increase student familiarity with the NCS?

Does the Traffic Light Report stimulate self-assessment skills development?

Can the Traffic Light Report be utilised as a tool for Assurance of Learning?

What are the lessons learnt from the implementation of an educational intervention (Traffic Light Report)?

5a. Embedded Publication (Paper 4); Sustainable? Traffic Light Report combines competency standards and self-assessment for students' life-long learning.

All of the research contained within this Chapter will be published as a Book Chapter;

Nash, R., Chalmers, L., Stupans, I., & Brown, N. (2016). Sustainable? Traffic Light Report combines competency standards and self-assessment for students' life-long learning. In F. Padro, K. Trimmer, D. Thorpe & T. Newman (Eds.), Higher Education in the Professions: Case Study Illustrations of Quality Practice (Vol. 1). Toowoomba: University of Southern Queensland. Blind peer review, [IN PRESS 30/06/2016]

Acknowledgements: The authors acknowledge the contribution of all participants- students and educators. Thank you to Peter Gee for ensuring my design ideas could be captured in the Access database. Thank you to Cameron McShane and Colin Curtain for your assistance with writing queries in the database so the Traffic Light Reports could be made available to students for their learning.

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5b. Embedded Publication (Paper 5); Content knowledge has a use-by date, self-assessment skills last a life-time.

All of the research contained within this Chapter will be submitted to Journal of Teaching and Learning for Graduate Employability on 30/6/2016.

Acknowledgements: The authors wish to acknowledge the contribution of all participants- students, educators and academics. Thank you to Dr Colin Curtain for assistance with database programming and qualitative analysis techniques and Cameron McShane and Peter Gee for support with the Access database design and programming.

6.1 Abstract

Educators are increasingly focussed on developing graduates' life-long learning skills, including self-assessment skills. Development of such skills will directly influence a graduate's ongoing employability. The Traffic Light Report (TLR) was a novel educational intervention that provided students with an opportunity to practice self-assessment. This paper reports on an analysis of TLR data specifically focusing on its potential as a tool for self-assessment skills development and as a tool to measure self-assessment accuracy. In Semester 1 and 2, 2014 the TLR was trialled with pharmacy students at one Australian university. The TLR combined three elements – the National Competency Standards for Pharmacists in Australia (NCS), Miller's pyramid of clinical competence and a traffic light scale corresponding with grades. Individual student grades, as assessed by their educators, were directly compared with each student's self-assessment on the same scale. In Semester 1 only 43% (367/850 instances) of students' self-assessments on the traffic light scale were consistent with the educators' assessments. There was a statistically significant increase in consistency between Semesters 1 and 2 (59%; 611/1028 instances) ($p < 0.001$), implying that

self-assessment skills improved with practice. In interpreting this finding we must be cognisant of the complex processes and dimensions of informed self-assessment. With modification, the TLR has potential portability to other professional disciplines.

Keywords: self-assessment, grade prediction, life-long learning, competency standards, pharmacy.

6.2 Rationale and Research Question

Self-assessment skills are essential for student success in higher education and subsequent life-long learning (Boud, 2000; Boud, 2010; Cassidy, 2007), consequently educators are increasingly focussed on developing methods for fostering these skills. This research sought to determine: *Does the Traffic Light Report (TLR) educational intervention stimulate self-assessment skills development?* The TLR was trialled in 2014 with pharmacy students at one Australian university. The TLR enables a course-level comparison of student self-assessment accuracy (predicted grade) compared to educator grades. The TLR findings are discussed within Sargeant et al.'s (2011) six processes and dimensions of informed self-assessment. The authors explore the limitations to the use of grade prediction for determining effects on self-assessment skills development. This research offers the higher education sector a novel approach to fostering self-assessment skills and contributes to the literature by offering a number of insights from its development, implementation and evaluation. The TLR has potential portability to all professions that have well defined graduate outcomes or competency standards. The findings have implications for higher education, educators, students, the pharmacy profession and the public.

6.3 Background

Self-assessment has been recognised as a “tangled web” (Cassidy, 2007) of complex metacognitive skills (awareness and understanding of one's own thought processes) (Hattie, 2008) reliant on a dynamic process of accessing and interpreting varied external and internal data (Sargeant, et al., 2011). Epstein et al. (2008) define self-assessment as

‘a process of interpreting data about our own performance and comparing it to an explicit or implicit standard’ and go on to say that ‘the power of self-assessment lies in two major domains – the integration of high quality external and internal data to assess current performance and promote future learning, and the capacity for ongoing self-monitoring during every day practice.’ (Epstein, Siegel, & Silberman, 2008, p. 11).

Self-assessment development in higher education

Quality in higher education can be defined as *'fitness for purpose, fitness of purpose and performance to an agreed standard'* (Krause et al., 2014, pg. 79). For professional disciplines this “fitness” relies on the development of life-long learning skills (Ryan, Hanrahan, Krass, Sainsbury, & Smith, 2009), which are now a minimum requirement for all university graduates (Berdrow & Evers, 2011). Students and practitioners *'taking control of their learning is what life-long learning is all about'* (Biggs & Tang, 2011, p. 76). Life-long learning has been defined as;

'a continuously supportive process which stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding they will require throughout their lifetimes.' (Watson, 2003, p. 3).

Life-long learning requires that individuals are able to work independently and also assess their own performance and progress (Falchikov & Boud, 1989), thus self-assessment is essential to a student's current and future learning needs. Self-assessment at a tertiary level is recognised as a critical pedagogical and assessment tool to support students in their transition to professional careers (Bourke, 2014; Ronfeldt & Grossman, 2008).

Boud highlights the importance of self-assessment and informed judgement (Boud, 2010) in his Sustainable Assessment framework. The framework is designed to support educators seeking to foster student development of life-long learning skills. Evidenced through 'assessment for learning' (Mumm, Karm, & Remmik, 2015), 'assessment to expand professional horizons' (Ben-David, 2000) and 'sustainable assessment' (Boud, 2010) strategies, an educator's assessment choices can impact student learning now and in the future. Student-centred learning approaches such as these provide students with opportunities to develop “visible learning skills”, which are essential precursors for successful life-long learning. Consistent with Boud's framework, Hattie defines visible learning;

‘when students become their own teachers and exhibit self-regulatory attributes that seem most desirable for learning (self-monitoring, self-evaluation, self-assessment, self-teaching)’ (Hattie, 2008, p. 22).

In 2008, Hattie’s seminal meta-analysis revealed that self-reporting grades, feedback and metacognitive strategies were considered in the top 13 of the 138 major influences on learning. All of these three major influences on student learning are also central to professional Continuing Professional Development (CPD) practices essential to a graduate’s ongoing employability.

Pharmacy context

For the health disciplines, CPD is a mandatory requirement and a condition of re-registration to practice. This is a justifiable measure to ensure the safe delivery of health services to the public. Australian pharmacists are mandated to self-assess against the National Competency Standards for Pharmacists in Australia (NCS) in their CPD practice and are directed to make the relevant NCS explicit in their CPD plan (Pharmacy Board of Australia, 2015). However, in practice, the profession’s reported use of NCS during CPD practice has been inconsistent with these practice expectations (Nash, Chalmers, Stupans, & Brown, 2016; Thompson, Nissen, & Hayward, 2013).

The importance of self-assessment to professional courses such as pharmacy has been recognised for over 20 years (Gordon, 1992). International professional guidelines (International Pharmaceutical Federation, 2009) and local Australian guidelines (Australian Pharmacy Council, 2012) support the use of self-assessment practices in pharmacy education. The importance of self-assessment is mirrored by the views of higher education researchers (Boud & Falchikov, 2005; Boud & Soler, 2015; Eva & Regehr, 2008; Kearney, 2012; McMillan & Hearn, 2008; Mumm, et al., 2015). Sharif et al. (2007) suggest that for translation to practice self-evaluation must start early (with undergraduates); this is supported

by the Australian Pharmacy Council (APC) who make explicit the requirement that educators prepare graduates for life-long learning;

'The goal of initial pharmacy education is to produce graduates with the requisite knowledge, skills and attributesand to engender a commitment to life-long learning' (Australian Pharmacy Council, 2012, p. 5).

How is self-assessment measured?

Development of self-assessment skills is not easily measured. In fact, most methods fall short of capturing the actual learning benefits that many self-assessment schemes offer their participants (Falchikov & Boud, 1989). Falchikov and Boud undertook a meta-analysis which identified fifty-seven studies that compared self and teacher marks utilising a variety of approaches (Falchikov & Boud, 1989). These included student prediction of overall course grade or grade point average, assessments of a variety of course assignments, and the evaluation of different types of practical skills. Common metrics that have been applied to student and teacher marks in the past include correlation co-efficient and percentage agreement. A number of factors require consideration in attempting to measure self-assessment. In medical education, Sargeant et al. (2011) describe six interconnected processes and dimensions of informed self-assessment including;

1. external and internal conditions,
2. sources of information,
3. interpretation of information,
4. internal influences,
5. responses to information and
6. tensions between and within people and within the learning or practice environment.

In the process of self-assessment, the sources of information, interpretation of information and responses to information are all highly influenced by external and internal conditions and influences. These include the learning and practice climate, relationships, credibility of the information and personal attributes (emotions, experience, confidence) (Sargeant, et al.,

2011). To measure self-assessment and account for all of these may be an impossible task. In addition, Epstein et al. challenge whether we can assess self-assessment given it is fundamentally an internal process (Epstein, et al., 2008).

6.4. Background to the TLR design

The TLR combined three elements to ensure the applicability of the NCS to students in their learning context; NCS, Miller's pyramid and the traffic light scale. As described by Epstein et al. (2008) self-assessment relies on an explicit or implicit standard. In the case of the TLR all three elements were combined to provide that explicit standard. Each is now presented.

National Competency Standards (NCS)

The NCS outlines the competencies required of registered pharmacists to consistently observe and exercise accountability for the standard of healthcare they deliver to the public. They contain eight domains and thirty-three competency standards. The profession describes these competencies (NCS) as:

'the skills, attitudes and other attributes attained by an individual based on knowledge (gained through study at university) and experience (subsequent practice) which together are considered sufficient to enable the individual to practice as a pharmacist.'
(National Competency Standards Framework for Pharmacists in Australia, 2010, p. 3).

Miller's pyramid

Pharmacy students in Australia qualify to register following four years of undergraduate studies and one year of supervised practice as an intern. Unlike some other professions, pharmacy graduates do not register at the point of graduation. The NCS are currently written at "entry-level" or the point of registration which provides an awkward gap for educators. It was necessary to "scale" the NCS to ensure they were relevant to students in their context.

The base of Miller's pyramid represents knowledge components of competence; *knows* (basic facts) followed by *knows how* (applied knowledge), *shows how* (simulated performance), and

then *does* (in the practice setting) (Wass, Van der Vleuten, Shatzer, & Jones, 2001). Miller's pyramid was combined with the NCS to provide students with a competence continuum (Coombes, Bates, Duggan, & Galbraith, 2011) or scaled appreciation of their progress. Whilst the literature describes other frameworks and taxonomies (Biggs & Collis, 1982; Krathwohl, 2002; ten Cate, Snell, & Carraccio, 2010), Miller's pyramid provides a simple conceptual model of clinical competence (Miller, 1990) which has been previously utilised in medical education.

Traffic light scale

Whilst Miller's pyramid can communicate the level of performance on the competence continuum, students required an additional scale to enable them to self-assess their predicted grade. The traffic light scale representing green (okay), orange (may need attention), red (requires urgent attention) has been utilised in project management (Hamilton, Byatt, & Hodgkinson, 2011) and has been applied in "assessment for learning" strategies involving self and peer assessment activities with primary school aged children (Hodgson & Pyle, 2010). The traffic light is readily recognised and easily understood rendering it a useful scale for student self-assessment activities.

6.5 Methodology

A pragmatist methodological frame (Creswell, 2013), educational design (Van Den Akker, 2013) and action research philosophies (Creswell, 2013) informed the authors' approach. Mixed methods (quantitative and qualitative data) were applied to address the research question.

6.6 Method

Participants

Conducted in Semester 1 and 2, 2014, the TLR was a voluntary project involving students enrolled across the 4-year pharmacy course. Students self-assessed their performance against the NCS and received an individualised TLR report. Following receipt of their TLR students were invited to complete a feedback survey. Participant demographics are provided (Table 18).

Table 18. Demographics of self- assessment respondents and survey participants

	Self-assessment respondents		Survey respondents*	
	Semester 1 n=163	Semester 2 n=198	Semester 1 n=72	Semester 2 n=30
Respondents (n)	69	52	36	15
Gender Male	21	20	10	9
Female	48	32	26	6
Year 1	0	1	0	2^
2	28	12	21	4
3	21	23	6	4
4	20	16	9	5
Prior Study	-----	-----	11	2
Age Average	-----	-----	21.92	22.93
Median (SD)	-----	-----	21 (2.96)	22 (3.45)

*who also recalled/reported completing self- assessment. ^implies one student recalls completing SA may not have submitted it or were ineligible for the TLR due to withdrawal. This project commenced prior to census, student enrolment figures and emails for invitation could not be confirmed until consensus in Semester 1. Some students were repeating Semester 2 but not Semester 1 subjects. Both explain the difference in the denominator between semesters.

Procedures

The project is described for a pharmacy course at one Australian university, where the course (program, degree) is structured around units and a full time course is comprised of four units per semester over two semesters per year. Each unit included 2-8 assessment tasks with an

even distribution of assessments course-wide (Semester 1: 49 assessments, Semester 2: 47 assessments).

This research was approved by the Social Sciences Human Research Ethics Committee (Tasmania Network); H00013591. RN handled all data and disseminated the TLR; to eliminate ethical concerns she held no teaching responsibilities at the time of the project.

At the end of each semester, the TLR project provided individual summary reports to each student which presented academic grades based on the educators' summative assessments and their self-assessed predictions of summative results. Collection of each set of data is now described.

Academic grades

To produce the reports, educators entered assessment tasks for each unit and the NCS relevant for each assessment task into a customised Access database. Thus a map was produced of all the relevant NCS for each assessment task in the course. To generate the TLR, educators provided students' academic grades (including examination results) at the conclusion of each semester. Each academic grade was converted into a corresponding colour on the traffic light - i.e. Green (High Distinction; 80-100%, Distinction; 70-79%, Credit; 60-69%), Orange (Pass; 50-59%), Red (Fail; 0-49%). Queries were written into the TLR database to combine each student's grade on each assessment task with the previously entered mapped data. Each assessment task in the course potentially related to multiple NCS; for example, the Residential Management Review Report (which required students to undertake a medication review) corresponded to five competency domains. The database was programmed to identify the assessment tasks corresponding with the student's highest grade (e.g. Green was higher than Orange). This data populated column 1 of the student's individualised TLR (see Figure 13).

Self-assessment (grade prediction)

Students were invited to self-assess at the end of each semester when they had completed end of semester examinations and had received all summative results except for those of their final examinations. Via written and video instructions, they were asked to consider each competency standard and use the traffic light system to indicate if they felt the NCS required their further attention through individual learning; selecting Green for ‘okay’, Orange for ‘may need attention’ and Red for ‘urgent attention’. They were also requested to provide an example assessment corresponding with each NCS from the prior semester. Student self-assessment regarding the grade and performance level they anticipated were imported into the database and populated column 2 of the TLR, as seen in Figure 13.

Traffic Light Report

Following the release of exam results, students were sent their individualised TLR. Figure 13 shows an excerpt of a TLR (an example of a full report is available in Appendix 4). The authors provided students with instructions alongside the report which explained TLR content and also encouraged students to compare the two TLR columns (their predicted grades compared to the academic grades received for each TLR).

Figure 13. Excerpt from a Fourth year student's Traffic Light Report displays "summative assessment" alongside "self-assessment" on Domain 1. Students self-assessed on all 8 Domains

National Competency Standards for Pharmacists (2010)	Summative assessment (Column 1)		Unit/Example Assessment	Self-assessment (Column 2)		Student's Example
	Miller's	Traffic Light		Miller's	Traffic Light	
1.1 Practice legally	Does	Orange*	CSA414 Written Examination	Does	Green	Dispensing practicals 1.1, 1.2, 1.3 CSA457 workshops; providing medical certificates 1.1, 1.2, 1.5
1.2 Practice to accepted standards	Does	Orange	CSA457 Residential Medication Management Review Report	Shows	Green	
1.3 Deliver 'patient-centred care'	Does	Orange	CSA457 Professional Services Pitch	Does	Green	
1.4 Manage quality and safety	Shows How	Green	CSA406 Tutorial Assessment	Does	Green	

Units: CSA414-Clinical Pharmacokinetics 4, CSA457-Pharmacy Skills in Practice, CSA406-Therapeutics in Practice,

*Instance: Each student had multiple assessments and each assessment may have been associated with multiple relevant NCS; these are referred to as 'instances' which are coded as a green, orange or red.

Measures and Analysis

Miller's pyramid and the traffic light scale were separated for analysis. Although applied and reported together it was determined Miller's pyramid represented performance level, whereas the traffic light scale more closely reflected academic grade. A separate discussion of the results from Miller's pyramid has been reported (Nash, Stupans, Chalmers, & Brown, 2016). The comparison of students' academic grades with their self-assessments provides insight into student self-assessment accuracy. In order to enable data analysis of self-assessment accuracy an 'instance' was defined. If, for example, on a particular assessment task such as the Residential Medication Management Review a student received a pass (Orange) on Competency Standard 1.1 (Practice legally) this was considered one instance. The corresponding instance for comparison came from the student's self-assessment (column 2); in this example the student self-assessed higher (Green) (Refer to Figure 13). The data was extracted from the TLR database. SPSS version 22 was utilised to perform non-parametric (chi-square and Fisher's exact) analysis, to compare data from students and educators. Students provided feedback on their experience with the TLR in a survey.

6.7 Results

Consistency between predicted and academic grade

In Semester 1, 42% (69/163) of invited students participated. In Semester 2, 26% (52/198) of the invited cohort participated (Table 18). Students' self-predicted grades on the traffic light were inconsistent with their academic grades across both semesters (percentage agreement: 43% in Semester 1 and 59% in Semester 2), although consistency increased from Semester 1 to Semester 2. Students showed a tendency to predict lower than their academic grades, with 30-40% of students doing so in both semesters. In contrast, the percentage of students who

predicted higher than their academic grades decreased from 18% in Semester 1 to 8% in Semester 2 (Table 19).

Table 19. Agreement between student self-assessment and academic grades

	Student self-assessment consistent with summative assessment results	Self-assessed higher	Self-assessed lower	p ^a
Traffic light scale				
Semester 1 (n=850)	43.2% (367/850)	18.5% (157/850)	38.4% (326/850)	<0.001
Semester 2 (n=1028)	59.4% (611/1028)	8.2% (84/1082)	32.4% (333/1028)	

^a Chi-square test of comparison of Semester 1 to Semester 2 results. n represents the number of instances of self-assessment against NCS.

Twenty-eight of the 121 students completed the self-assessment in both semesters. For this sub-group there was a statistically significant increase from Semester 1 to Semester 2 in traffic light instances that were in agreement - 41% (123/297) in Semester 1 vs 58% (171/297) in Semester 2 ($p < 0.001$).

Figure 14 highlights the differences between year groups. There was less agreement between self-assessed and academic grades for students in the earlier years of the course; agreement was greatest for Semester 2 fourth year students.

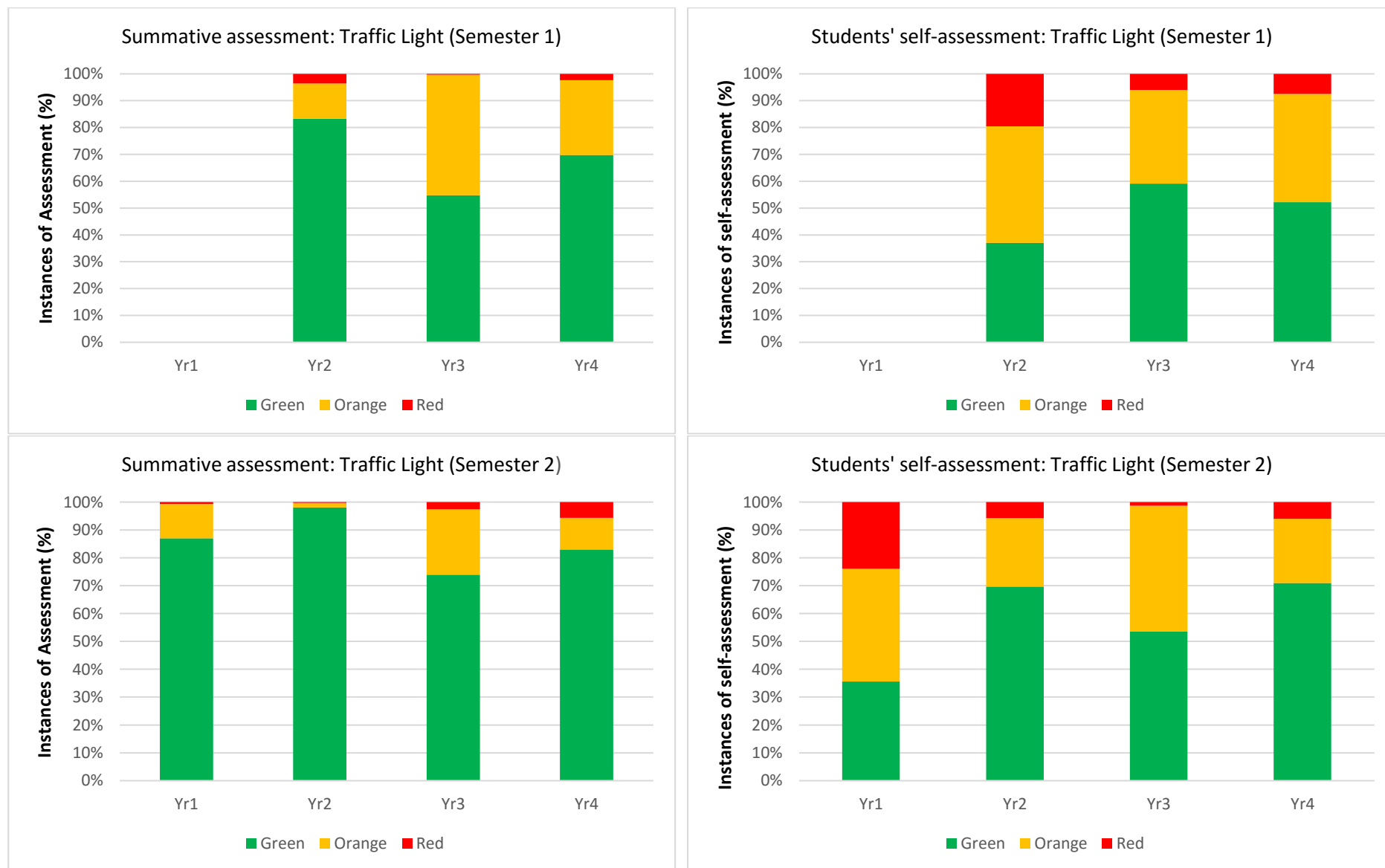


Figure 14. Summative assessment results contrasting with student self-assessment across the four years of the pharmacy course

Feedback Survey

Over both semesters 104 participants responded to the feedback survey (Table 18).

Student self-reported motivation for completing the self-assessment included curiosity or interest in TLR results, a sense of duty, internal motivation and a sense of responsibility for learning needs, for example; *'It took me hours to read through the CS one by one to complete the survey. But it is good to have a guideline for me to self-evaluate and see how I am going'* (Year 3, Female, 21). Other students' motivations were consistent with future focussed attitudes to learning; *'Because I need to know which areas from those standards that I am still lacking of and need improvement'*. (Year 3, Male, 23) and *'To identify areas where I need to work on in the future'* (Year 4, Female, 25). Some students' comments reflected a desire to look ahead to identify with the needs of the profession; *'To see where my skills and knowledge are, compared to what is required of a registered pharmacist, and to identify areas of improvement'*. (Year 2, Female, 21). Some students utilised the TLR as an opportunity for calibration or comparison of learning, reflected by these student comments; *'So I could self-assess and then see where I actually ranked'* (Year 2, Female, 24) and *'Thought it was a good opportunity to see where I was actually sitting compared to what I thought'* (Year 2, Female, 21). For others, motivation to participate was the desire to determine course relevance to NCS; *'To gain an idea of where the Competency Standards have been included in the course'* (Year 4, Female, 22).

Of the respondents, 60% (24/40) reported they found the TLR useful and 55% (28/51) agreed that the self-assessment tool was user-friendly. Their reasons included the powerful insight gained from the self-assessment exercise and the information in the report, for example *'It was interesting seeing where the NCS has been assessed this semester according to my lecturers- I hadn't thought of all the different assessment pieces that there were that were relevant'*. (Year 4, Female, 22). Others reported they valued the future focussed perspective it

gave them of their course *'I found it beneficial to see how I am going and how the course is really preparing me for my future career.'* (Year 2, Female, 18), whilst others appreciated the insight on their required future learning to become a pharmacist, *'It was good to see how your results compare with what you've actually been assessed as, especially because I need to be assessing myself against the competency standards in the future.'* (Year 4, Female, 22) and *'I will look back on it during my intern year to assess my own progress then using similar methods.'* (Year 4, Female, 22). The content of the report also gave some respondents reassurance and confidence in their own knowledge and abilities; others felt it provided an opportunity for increasing familiarity with the NCS and self-assessment skills practice.

However, not all participants found the TLR user-friendly, for example *'I thought it was difficult to answer the questions coming from a student perspective when we don't dispense or do a lot of the NCS in practice...'* (Year 2, Female, 21) and *'It can be a bit confusing, maybe making it simpler to fill out would be better or giving examples where each standard might have been assessed during school year practically, would be more helpful.'* (Year 4, Female, 25). Others students reported they did not appreciate its relevance to their current learning; *'...would have been just as useful in my current stage of study to just get the actual assessment because I was not really aware of where each of the competency standards were covered in my units.'* (Year 2, Female 19) and *'Pointless to alter my learning approach on arbitrary information.'* (Year 2, Male, 31) and *'I didn't see how it could help me as a uni student.'* (Year 2, Female, 20). Finally, others had difficulty accepting the external source of information *'No maybe for some people this assessment is like a report card so they refuse to know the results if they happen to have bad results.'* (Year 3, Female, 26) and *'I do not think the overall mark for an assessment is sufficient to comment on my ability in one specific standard as my assessments tend to be disproportionate between different marking criteria.'* (Year 2, Male, 20).

Ninety-three percent (37/40) of students compared their self-assessed and academic results in the TLR. Sixty-four percent (25/39) indicated they would be interested in having access to the TLR in the future. Although 100% agreed video instructions were useful, very few utilised them. Students provided suggestions to improve the TLR including linking it to the university learning management system; offering a 'not yet assessed' option in the self-assessment; providing more examples of assessments related to the NCS in the self-assessment tool and TLR; utilising it during tutorials and scheduled compulsory experiential placements; and using it from the first year of the course through to post-graduation.

6.8. Discussion

This paper reports on the analysis of the TLR data with a specific focus on its ability to stimulate the development of self-assessment skills. Whilst the TLR did provide an opportunity to practise self-assessment skills, to measure its effect is difficult. If we make the assumption that the comparator (educators' assessed grades) is accurate and calibrated course-wide, the improvement in agreement from Semester 1 to Semester 2 is encouraging and may suggest some development in self-assessment skills as a consequence of self-assessment skills practice facilitated by the TLR. Overall, students recognised the usefulness of the TLR, however the majority reported it was unlikely to change their future learning approach.

The findings provide an opportunity to explore two separate but related uses for the TLR - as a tool for self-assessment skills development, and as a tool to measure students' self-assessment accuracy determined by consistency with educators' assessed grades. How the two are related to a student's ability to trust the external information in the TLR will relate to how consistent the external source of information is with the student's point of view.

Sargeant et al. (2011) describe self-assessment as a “tangled web” and suggest that through the realisation that the components are not static and relationships are not linear and predictable we can better understand why self-assessment accuracy seems to be frequently unreliable. The TLR findings are now discussed within each of Sargeant et al.’s six processes and dimensions of informed self-assessment to determine if a novel educational intervention such as the TLR can stimulate self-assessment skills development important to a graduate’s long-term employability.

External and internal conditions

The literature describes a number of external and internal conditions which are likely to affect predicted grade accuracy amongst students. These include; discipline area, expertise in a particular field (senior students), type of self-assessment activity (Falchikov & Boud, 1989), gender (Blanch-Hartigan, 2011) and academic performance (Jackson, 2014).

The TLR was a voluntary task, which is beneficial from an education point of view (Boud, Lawson, & Thompson, 2013; Leach, 2010), however this led to limited participant numbers. Consequently, the statistical power of the TLR results would be diluted if we dissected the data further into sub-categories such as academic performance and gender, although we acknowledge the value of doing so has been highlighted elsewhere (Blanch-Hartigan, 2011; Falchikov & Boud, 1989).

One condition we did consider was year of study. Figure 14 provides a breakdown of the data by year group to describe improving consistency in the latter years of the course; this needs to be interpreted with caution given the small participant numbers. This finding is consistent with the education literature which suggests increased consistency can be linked to the seniority of the students and their associated increase in expertise in their field (Falchikov & Boud, 1989). For the participating pharmacy students this finding could also be attributed to

increasing relevance of NCS with increasing year of study, whereby pharmacy students are learning and applying their knowledge and skills in the practice setting more regularly.

The literature can also offer some insight into the internal conditions that may help to explain the TLR findings. Blanch-Hartigan's (2011) meta-analysis in medical education explained the various factors commonly associated with over and under-assessment and found females were more likely to under-estimate their abilities in comparison to their male peers.

Consistent with this, our female dominated cohort may have contributed to the under-estimation pattern. Equally, Jackson (2014) reported that students who are high academic achievers are more likely to be accurate self-assessors. Improved agreement in Semester 2, with a reduced likelihood to over-estimate performance, could have been a consequence of higher achieving, more motivated students volunteering again in Semester 2. In addition these students may have calibrated their reflection based on their summative assessment results from Semester 1; this calibration is also described by Leach (2010). Whilst consistency is the aim in terms of measuring self-assessment accuracy, the predominant under-estimation exhibited by our participants may be considered safer in the health disciplines.

Evidenced by the patterns in Figure 14 and the student comments, the students in the earlier years of the course had difficulty relating to the NCS in their context. In comparison, by fourth year (Semester 2) the observed increase in agreement may have been a consequence of the NCS being more obvious in assessments when students were predominantly in practice settings. This finding may also be a consequence of student perception that the earlier years of the course are more science-focussed or a symptom of the fact the current language used in the NCS rigidly reflects an entry level pharmacist. In addition, a year-long internship following graduation produces a gap which may make it difficult for students to relate to the NCS written for entry level pharmacists. Some students suggested the TLR may be better suited for use during their experiential placements and once in their internship. The authors

had considered reserving the TLR for the latter years of the course but introduced it earlier in an attempt to increase student knowledge of the NCS in conjunction with developing students' self-assessment skills for life-long learning. Indeed the positive effect on student acceptance of the relevance of the NCS has been reported (Nash, et al. 2016 IN PRESS).

Sources of information

Sources of information utilised in self-assessment can be both external (people, processes) and internal (emotions, experiences and confidence) (Sargeant et al. 2011). The TLR sought to encourage the use of both. This is supported by realisation that when a student predicts their own grades it offers them a rich form of feedback to improve and motivate that student to learn (Sadler, 1989). As described by Sadler (1989), feedback (teacher, peer or self) must help learners fill the gap between where they are in their understanding and where they need to be to achieve success.

The TLR design may have created factors which influenced its outcomes and acceptance. The first is the reliability and consistency of the mapping. To populate the 'assessed' column in the TLR an individual student's performance in their summative assessment tasks was combined with the educators' mapping of each relevant NCS. The educators' mapping relied on educators being familiar with the NCS. Results from a nationwide survey (Nash, et al., 2016) and interviews with Australian pharmacy educators (Nash, Chalmers, Stupans, & Brown, 2015) suggest that Australian pharmacy educators generally have poor familiarity with the NCS. This could have influenced the ability of the educators at the trial site to accurately map their curriculum to the most relevant NCS and may have affected the reliability of the mapping and therefore the quality and consistency of the external source of information.

The consistency of the external information is questionable given educators mapped the curriculum in isolation. Whilst our students experience the curriculum as a whole, educators

can at times be guilty of interpreting their unit(s) in isolation (Harden, 2001; Harden & Stamper, 1999; Lawson et al., 2015). If all members of a teaching team are present during a mapping exercise, the process of mapping a course is more valuable than the product (Kelley, McAuley, Wallace, & Frank, 2008). If constructed together the product can be utilised in initiatives like the TLR to assist their educators and students to appreciate the whole (curriculum) is greater than the sum of the individual parts (Harden, Davis, & Crosby, 1997).

As students self-assessed their progress holistically it was necessary to integrate student results course-wide. Thus for the purposes of this project, the NCS were mapped retrospectively to the existing assessments in the curriculum rather than embedded in original curriculum design. At the time of assessment students were not provided with TLR rubrics to communicate expectations against the NCS. This is problematic given the usual subjectivity associated with assessment practices. The absence of TLR rubrics to communicate expectations in the assessment phase meant a green traffic light in one unit (corresponding with a CR, DN, HD) may not have been equivalent to a green traffic light in another. Assessment of any kind has a tendency to be subjective (Falchikov & Boud, 1989; ten Cate, et al., 2010) and heavily influenced by educators' expectations of their students (Trigwell, Prosser, & Waterhouse, 1999); this may have led to the lack of agreement as interpreted by multiple educators and students.

The TLR's programmed method for selecting data may have also contributed to the inconsistencies and difficulty for students to accept the external source of information. The approach was appropriate for competency based assessment but is contrasting with the assessment that is predominantly used in the university setting. Rather than an average result, or the student's final performance against the NCS the database was programmed to identify the highest result from all the students' summative assessments in the prior semester to populate the 'assessed' column. For example, if a student performed at a red (fail) for 5 of 6

assessments but was awarded a green for the sixth assessment, they received a green for that NCS. This may have provided an 'assessed' result that was higher than how students reflected holistically on their performance. All of these factors may have led understandably to students questioning the credibility of the external information.

Interpretation of information

A student's interpretation of the information is impacted by internal influences (emotions, experience and confidence). Students may choose to reflect, calibrate, filter or assimilate with the external information they are provided (Sargeant et al. 2011). Few students utilised the video instructions that were provided to assist them to complete the self-assessment and interpret their TLR. This may have affected students' ability to complete the self-assessment task and interpret their TLR.

The work of Falchikov and Boud (1989) suggests self-assessment against something that is foreign is likely to be challenging. Previous research suggests that student familiarity with the NCS at the university of interest prior to the work of the TLR project was sub-optimal (Nash, Chalmers, Stupans, & Brown, 2016 IN PRESS). Students may have benefited from more TLR user support and self-assessment skills development prior to participation.

Student self-assessment consistency appeared to improve with practice. Whilst Hattie's meta-analysis described self-report of grades as the most effective method for learning, the pharmacy education literature describes self-assessment accuracy as problematic for both students (Austin & Gregory, 2007; Dyke, Gidman, Wilson, & Becket, 2009) and registered pharmacists (Laaksonen et al., 2007; Pflieger, McHattie, Diack, McCaig, & Stewart, 2008). Skills practice (with individualised feedback) had a significant influence on self-assessment accuracy. The significant increase in agreement in Semester 2 may be the result of practice, and correspondingly increased familiarity with the tool and its components. Dyke et al. (2009) described a similar experience with their pharmacy students. McMillan and Hearn

(2008) have outlined the immediate and long-term learning benefits of employing self-assessment strategies for all university students. Pharmacy educators have discussed the importance of introducing students to the elements of CPD to encourage refined self-assessment and life-long learning habits in their future practice (Briceland & Hamilton, 2010; Tofade, Khandoobhai, & Leadon, 2012). The importance of practice (Boud & Falchikov, 2005; Bourke, 2014; Mumm, et al., 2015) and role of coaching in self-assessment, reflection and CPD elements are essential to its long-term success (Janke, Traynor, & Sorensen, 2011; Tofade, et al., 2012). However, implementation of life-long learning in the practice and education setting must be adequately resourced and supported.

Responses to information

In the final stages of informed self-assessment students may choose to ignore, reject, seek or accept the information. The student comments suggest they were distributed across all four tendencies. This affects how the information is or is not translated by the student to impact their future learning or practice.

As described previously, students who repeated the task may have interpreted their results in Semester 1, accepted the information and calibrated their self-assessment in Semester 2. This may result in the successful transfer of these skills to future learning.

Some students questioned whether the summative assessment column was any more accurate than their self-assessment. They exhibited ignore or reject tendencies. The student disbelief in the source of information may be valid given the poor educator familiarity with the NCS reported and described earlier (Nash, et al., 2016).

Tensions

As described there were tensions between educators' interpretations and potential variability in assessment course-wide due to subjectivity. A course-wide approach to mapping the

curriculum which involves all teaching team members discussing and calibrating their interpretation of the standards they are measuring their curriculum against is important. As described students may have a more holistic perspective of curriculum as compared with their educators. Course-level rubrics (Lawson, 2015) can be employed to address both of these tensions.

Students must see assessment and self-assessment as a means to learning (Mumm, et al., 2015). Unfortunately the relationship of the NCS to the curriculum was difficult for some students to appreciate and self-assessment was a foreign concept, seldom used elsewhere in the course. In a rapidly changing health workforce the importance of self-assessment to learning is vital. In recognition of the importance of CPD to pharmacy practice and patient outcomes, self-assessment is being implemented in pharmacy schools globally (Tofade, et al., 2012). For its success, educators and students must embrace self-assessment as a course-wide culture and provide opportunities for scaffolded development of self-assessment skills. The TLR provided its participants with an authentic assessment task, simulating CPD. The need for this is supported by O'Brocta et al (2012) who encourage CPD from the first year of their American Pharm D program. The TLR may also act as a motivator to students' current learning; through developing meta-cognitive self-monitoring skills students can develop greater appreciation for where they are headed (Biggs & Tang, 2011, p. 65).

Implications of TLR findings

Future TLR versions would be improved if curriculum mapping was calibrated, '*holistic, integrative, collaborative and maintainable*' (Lawson, 2014, p. 12). This is achievable with an embedded design, including course-wide scaffolding of self-assessment skills, teaching team meetings to design and map the curriculum together (Lawson, 2014), and a philosophy of self-assessment. Student self-assessment workshops to highlight its benefits, individual student TLR debrief meetings, personalised student learning plans, portfolio evidence to

support TLR results, peer assessment and mentoring programs would all be valuable additions.

Limitations

Voluntary participation, student workloads and survey fatigue led to low percentage response rates. Participating students may represent more motivated individuals in the course which may bias the results. Recall bias may have also influenced student feedback.

Future Research

A longitudinal study is warranted to determine the ‘sustainable’ effects of the TLR on pharmacy student learning and CPD practices into the future. The TLR could be trialled with larger student groups and other professional disciplines to compare outcomes. The profession could employ similar methods to encourage pharmacists to engage with their NCS for informing their CPD plan.

6.9 Conclusions

The TLR provided participating students with an opportunity to develop self-assessment skills. Although there was some evidence of greater consistency between student self-assessment and educators’ assessment over time, it is not possible to confidently conclude that the TLR did improve self-assessment skills due to the complex interplay in external and internal conditions associated with informed self-assessment. Limited participant numbers made it difficult to dissect the data any further and the willing participants may represent more motivated individuals. The TLR provides a novel approach to encourage students to engage in self-assessment, however the findings highlight that educational initiatives must be embedded course-wide. The TLR has potential portability to professional disciplines with well defined competency standards or graduate attributes. Healthcare professionals in

practice may wish to adopt similar approaches to encourage practitioners to engage with their profession's competency standards for the purpose of informing their CPD plans.

6.10 References

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5c. Embedded Publication (Paper 6); Traffic Light Report a new technique for Assurance of Learning?

All of the research contained within this Chapter was accepted on 31/3/2016 to the Journal of Learning Design.

Nash, R., Stupans, I., Chalmers, L., & Brown, N. (2016). Traffic Light Report provides a new technique for Assurance of Learning. Journal of Learning Design, 9(1), 37-54. doi: <http://dx.doi.org/10.5204/jld.v9i1.264>

Acknowledgements: Thank you to all the students and pharmacy educators who contributed their time and participated in the Traffic Light Report educational intervention. Thank you to Dr Colin Curtain for his support with programming (Access database queries) and guidance on quantitative analysis. Thank you to Cameron McShane for his support with programming (Access database queries).

7.1 Abstract

The Traffic Light Report (TLR) project is an educational intervention designed for pharmacy undergraduates. This paper reports on analysis of TLR data specifically focusing on its potential as an innovative tool which combines Miller's pyramid, technology and student voice to examine a curriculum for Assurance of Learning (AoL). In 2014, educators mapped each summative assessment to the relevant National Competency Standards Framework for Pharmacists in Australia (NCS) alongside levels of expected performance on Miller's pyramid of clinical competence (Knows, Knows how, Shows how, Does). Simultaneously, students were invited to self-reflect using the same performance levels. The Miller's scale enabled a comparison between students' and their educators' understanding of the performance level demanded by assessments. Analysis highlighted disconnect between

students' and their educators' interpretations of the same assessed curriculum. The TLR facilitates quality enhancement by providing educators and their students with a logical meeting point for discussing foundation, scaffolding and integration of assessment across a course for AoL. This has portability to other professional disciplines.

Keywords: Assurance of Learning, Curriculum Design, Self-reflection, Summative Assessment.

7.2 Background

Higher education providers in Australia are under increasing pressure to integrate professional standards in the development and assessment of Course Learning Outcomes (Australian Government Department of Education and Training, 2015). The National Competency Standards Framework for Pharmacists in Australia (NCS) is the relevant professional standard for pharmacists. The NCS are grouped into eight Domains; (1) Professional and ethical practice; (2) Communication, collaboration and self-management; (3) Leadership and management; (4) Review and supply prescribed medicines; (5) Prepare pharmaceutical products; (6) Deliver primary and preventative health care; (7) Promote and contribute to optimal use of medicines; and, (8) Critical analysis, research and education. The Australian Pharmacy Council, who accredit the university courses, highlight the importance of the NCS to pharmacy education;

‘Since the entry-level competencies are to be met at entry to professional practice, they can serve as a source of guidance to the teaching and learning expected...The goal of initial pharmacy education is to produce graduates with the requisite knowledge, skills and attributes for entry to an intern training program.’ (Australian Pharmacy Council, 2012, p. 15)

Pharmacist competence assures patient safety. Familiarity with the NCS should begin with first year undergraduates so they can engage with their profession’s competence continuum (Coombes, Bates, Duggan, & Galbraith, 2011) and continually monitor and improve their performance. Professional competency standards such as the NCS can be combined with a scale to communicate a logical continuum towards competence for educators and their students. Miller’s pyramid (1990) of clinical competence, which classifies competence along a continuum of ‘Knows’, ‘Knows how’, ‘Shows how’ and ‘Does’, is utilised by pharmacists and other health professionals worldwide for this purpose (General Pharmaceutical Council, 2011; Kelley & Demb, 2006; Wass, Van der Vleuten, Shatzer, & Jones, 2001). Other frameworks exist, however Miller’s pyramid is a simple conceptual model which can clearly

communicate the early stages of the competence continuum. Each level on Miller's pyramid represents increasing capability and increased integration of knowledge, skills and attributes. Prior to performing at a 'Does' level in the practice setting with a client, an individual must have developed essential underpinning knowledge, skills and attributes. For optimal learning and assured practitioner competence these stages are best scaffolded. In other words graduates, who have had their learning scaffolded and are provided a 'solid foundation' having progressed through the 'Knows' level (observation and basic knowledge recall), 'Knows how' (understands and applies knowledge) and 'Shows how' (integrates knowledge, skills, attitudes to perform in simulated settings) (Miller, 1990; Van Der Vleuten & Schuwirth, 2005; Wass, et al. 2001) are given the greatest chance of success.

Familiarity with the NCS among pharmacy students in Australia (Nash, Chalmers, Stupans, & Brown, 2016) and at the university of interest was discovered to be poor (Nash et al. 2016, IN PRESS). To address poor student familiarity with the NCS and develop students' self-reflection skills, the Traffic Light Report (TLR) project was conceptualised. The TLR elements (NCS and Miller's pyramid) were combined to ensure the usability of the NCS for educators and their students in their context. Influenced by the Triple Jump Test (Mészáros et al. 2009), the mileMarker (Szilagyi, 2008), topographical curriculum maps (Plaza, Draugalis, Slack, Skrepnek, & Sauer, 2007) and the work of Janke, Traynor and Sorensen (2011) the TLR applies a course wide approach to assure student learning. Essential to the TLR design is curriculum mapping. Curriculum mapping is commonly utilised in higher education to provide a course level summary of a curriculum, enable curriculum review and provide evidence for accreditation and quality enhancement requirements. Martone and Sireci (2009) suggest the mapping process is more useful than the results, as it helps educators see how assessments can connect to learning activities. Oftentimes, the mapping process and discussion it prompts amongst educators (and students) becomes the most valuable

component (Kelley, McAuley, Wallace, & Frank, 2008). Thus, a teaching team must design and map their course together (Lawson, 2014, 2015a) and assess their curriculum first for student learning and second in terms of its effectiveness to measure achievement (Boud & Falchikov, 2005). To support this, a range of mapping tools currently exist (Harden, 2001; Oliver, Ferns, Whelan, & Lilly, 2010) including, of particular relevance to the work reported here, Lawson's Curriculum Design Workbench (Lawson, 2014, 2015a). The Curriculum Design Workbench is built on a philosophy of Assurance of Learning (AoL) (AACSB International, 2013; Lawson, 2015b) which emphasises a teaching team approach to course design to ensure student knowledge and skills are scaffolded and, importantly, educators and their students are aware of where this scaffolding takes place (Lawson, 2015a; Lawson et al. 2015). In its most simplistic form AoL is defined as the process by which learning outcomes are measured against specific course goals (Hall & Kro, 2006).

This research utilised the data from the TLR to highlight that educators at the university of interest and their students describe a very different understanding of expected performance levels, as described through the Miller's pyramid. This paper seeks to explore possible reasons for this difference. The findings from the TLR have implications for educators, students and regulators and have portability to other professions.

7.3 Method

This project was conducted at one Australian university over Semester 1 and 2, 2014, where the full time pharmacy course is comprised of four units per semester. Each unit had 2-8 summative assessment tasks. Experiential placements took place in Third and Fourth year, students in First year visited the workplace briefly, whilst Second year students did not have scheduled placements. The data presented on Miller's pyramid in this paper is one part of the TLR research project, other applications and outcomes have been described and reported

elsewhere, including its ability to improve student knowledge of the NCS (Nash et al. 2016, IN PRESS) and provide opportunities to develop self-assessment skills (Nash et al. 2016, IN REVIEW).

A pragmatist methodological frame (Creswell, 2013), educational design (Van Den Akker, Gravemeijer, McKenney, & Nieveen, 2006) and action research philosophies (Creswell, 2013) informed the authors' approach. Triangulation of data (Creswell, 2013) from student self-reflection, curriculum mapping data and feedback surveys made it possible to interpret the curriculum from the viewpoint of students and their educators. Data collection for each perspective is now described to aid the understanding of the analyses carried out.

Educators' perspective (assessed curriculum)

For each assessment in each unit of the course, educators entered into a customised Access database details of the assessment task, the relevant NCS for each assessment, and the level of proficiency on Miller's pyramid that students were expected to achieve (Figure 15). A map was then produced of all the relevant NCS and level of Miller's proficiency for each assessment in the course. The authors interpreted this curriculum map as the educators' perspective of the assessed curriculum.

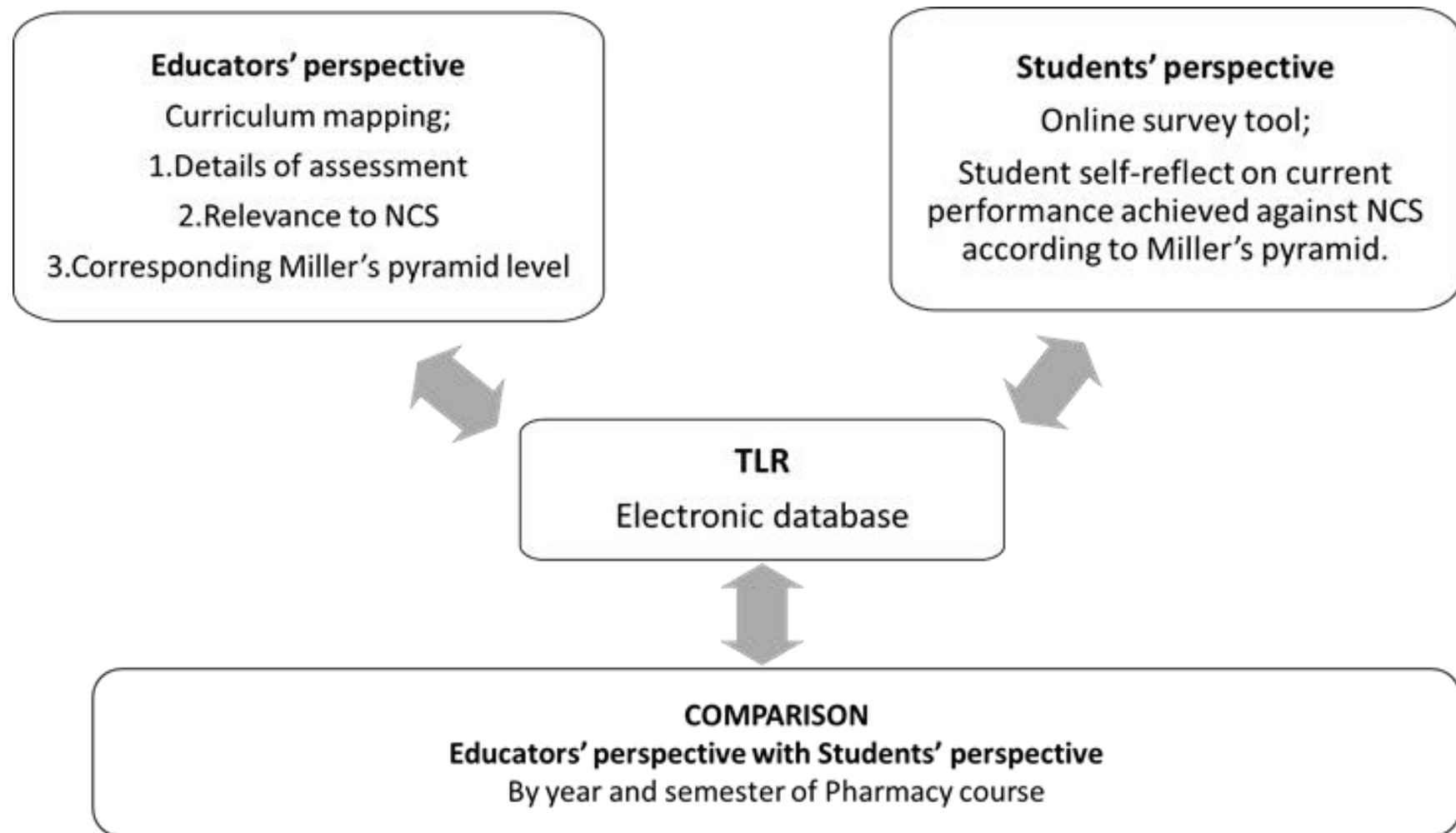


Figure 15. Design method and origin of data for TLR and associated comparison

Students' perspective (learnt curriculum)

At the conclusion of scheduled semester examinations, enrolled students were invited to self-reflect on their performance against the eight NCS on Miller's pyramid via a 10 minute online survey (Figure 16). The self-reflection was open for two weeks. Prior to this project, students had limited exposure to the NCS which consists of eight Domains, each containing multiple competency standards. Specifically students were asked to 'consider your current performance level (Knows, Knows how, Shows how, Does) for each competency standard (NCS).' The authors interpreted the results from this survey as the students' learnt curriculum.

Domain 1. Professional & Ethical Practice

* Domain 1. Professional and Ethical Practice

Consider your current performance level (Knows, Knows How, Shows, Does) for each Competency Standard (CS).

Then for each of the CS use the traffic light system to indicate if you feel the CS requires further attention.



Performance Level:

Knows (Knowledge eg Multiple Choice Questions)

Knows How (Describes how eg. Applies knowledge in written case)

Shows (Performance eg. Simulation, role play)

Does (Action-real life eg. Placements)

Traffic Light:

Okay (Green)

May need attention (Orange)

Urgent attention (Red)

	Knows	Knows How	Shows	Does	Green	Orange	Red
1.1 Practice legally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.2 Practice to accepted standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.3 Deliver 'patient-centred care'	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.4 Manage quality & safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.5 Maintain and extend professional competence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* Have any of the Competency Standard (CS) in Domain 1. Professional & Ethical practice been assessed in your B.Pharm this Semester?

Figure 16. Screenshot of the student self-reflection tool displaying how they reported their progress against the NCS and Miller's pyramid on Domain 1. This was repeated for the 8 Domains

Perspectives combined and contrasted

The educators' perspective was represented by the curriculum mapping entered into the TLR; the students' self-reflection provided the students' perspective (Figure 15).

This paper is focussed on the analyses of data associated with Miller's pyramid. For the purpose of this analysis, data were extracted from the TLR and summarised by year and semester of enrolment, for example, Fourth year, Semester 1. The "instances" used in the analysis were defined as:

- (i) an individual student's self-reflection on a given standard within the NCS, for example, "Practice to accepted standards" (Standard 1.1), at a "Does" level represents one instance; and,
- (ii) their educators' mapping against a given standard for an assessment task represents one instance.

As each NCS may have been mapped to multiple summative assessments, the database was programmed to select the instance where the student performed in assessment at the highest level on Miller's pyramid (e.g. 'Does' was higher than 'Knows'). The educators' mapping of the performance level of the summative assessment was directly compared with the Miller's level selected by the students in their self-reflection to determine agreement (i.e. whether the two perspectives matched). Non-parametric data analyses were conducted using SPSS version 22. These data were also extracted into the statistical program R to provide heat-maps which described the curriculum at an individual Domain level of the NCS. A 'hot spot' was where the ratio, indicating the perceived degree of focus of the curriculum on a particular NCS Domain at a given Miller's level, was greater than 0.6. The following provides an example formula utilised to generate the ratios reported in the heat-maps;

Ratio (Domain2KnowsYear2) = Count of Assessments on Domain 2 at Knows Level for all students in Year 2 / Count of Assessments on Domain 2 for All Miller's Levels for all Year 2 students.

This research was approved by the Social Sciences Human Research Ethics Committee (Tasmania Network); H00013591. RN handled all data and disseminated the TLR; to eliminate ethical concerns she held no teaching responsibilities at the time. Student involvement was voluntary. Following receipt of their TLR students were invited using an online survey to provide feedback on the TLR educational intervention.

7.4 Results

Students who participated in the self-reflection represented 42% (n=69/163) of the invited students in Semester 1 and 26% (n=52/198) of invited students in Semester 2. Table 20 provides a breakdown of student participation by year level and by semester of participation. Students are referred to in this paper, by Year of course, Gender and an identifying number, for example, (Year 2, Male19), and (Year 4, Female22).

Table 20. Student participation by semester/year level of course

	Year 1 <i>n</i> (%)	Year 2 <i>n</i> (%)	Year 3 <i>n</i> (%)	Year 4 <i>n</i> (%)	<i>n</i> =121
Semester 1	1 (1.45%)	27 (39.13%)	21 (30.43%)	20 (28.99%)	69
Semester 2	11 (21.15%)	18 (34.62%)	12 (23.08%)	11 (21.15%)	52

These ST (student) participants with multiple responses to individual assessment items, along with respective responses from educators (ED), generated 1878 instances in total. The key findings overall, related to the levels on Miller's pyramid, are that:

- In 397 (21.14%) of instances (n=1878), students self-reported their performance at a level higher than their educators.

- In 621 (33.07%) of instances (n=1878), students' self-reflection was in agreement with their educators' perspective.
- In 860 (45.79%) of instances (n=1878), students self-reported their performance at a level lower than their educators.

Despite this low level of agreement the scaffolded pattern outlined by students and educators in Figure 17 represents a consistent shift in focus from Knows/Knows how (acquisition of knowledge) to Shows how/Does (application of knowledge) for assessment across the 4 years of the course ($p=0.84$). Figure 17 shows general agreement amongst students and educators with the exception of Fourth year students who reported that 39.2% of their assessments examined them at Knows/Knows how level, whereas their educators' reported only 11.0% of assessments required their students to perform at this level; this difference was statistically significant ($p<0.001$)

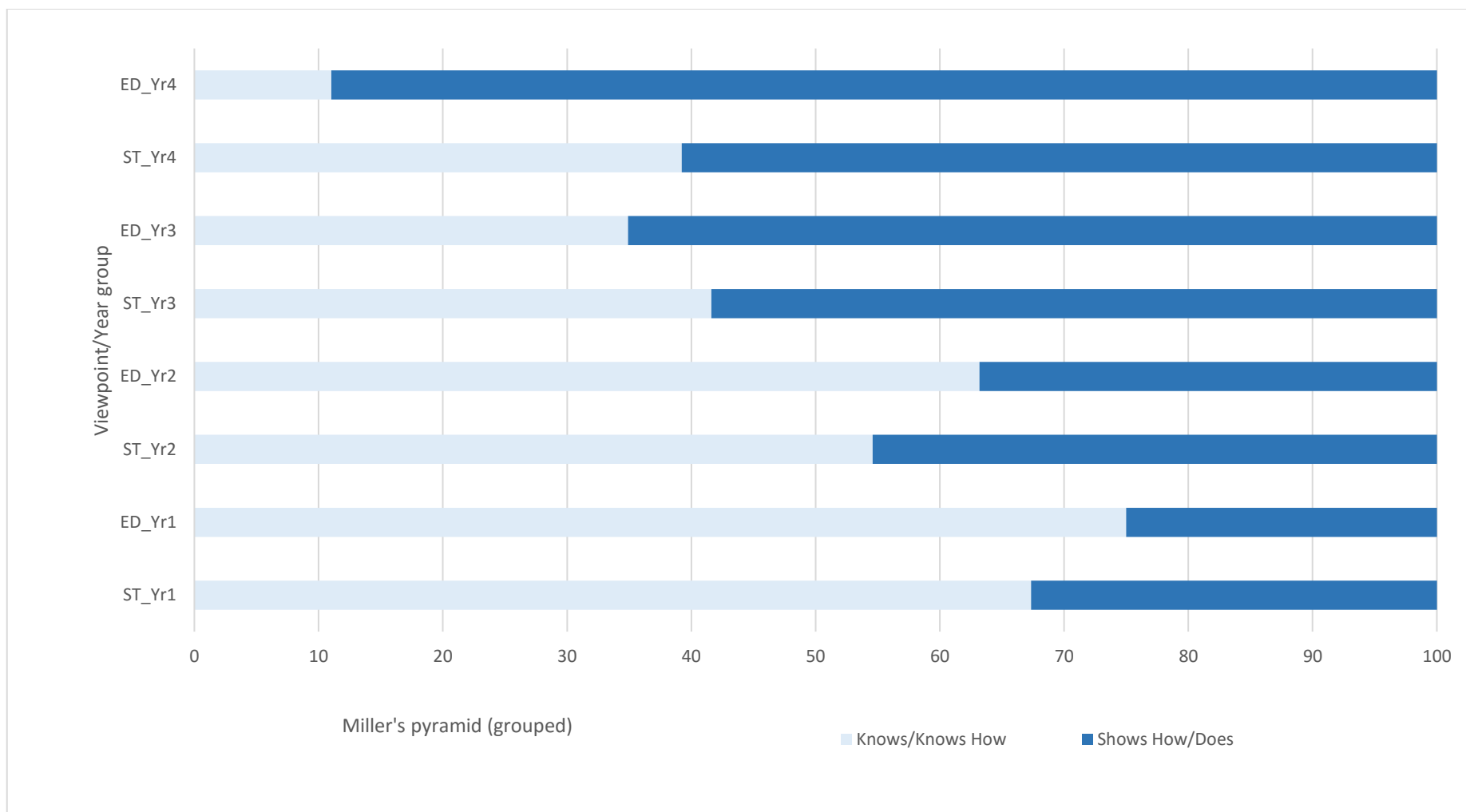


Figure 17. Educators' (ED) interpretations of the curriculum contrasted with their students' (ST)

Figure displays a scaffolded assessment pattern from Knows/Knows how (acquisition of knowledge) to Shows how/Does (application of knowledge) over the four years of the program.

Whilst this general picture is useful, the heat-maps (Figure 18 and 19) provide rich insights into the students' and their educators' perspectives of the assessed and learnt curriculum broken down by NCS Domain, year of enrolment and each Miller's level. The Domains and each Miller's level which had greatest emphasis in the curriculum (i.e. which were assessed multiple times) are depicted by 'hot-spots' (the areas of darkest shading) on each heat-map. From the educators' twelve and the students' nineteen 'hot-spots' there were five areas of the curriculum where students' and educators' views matched. These were;

Domain 2: Communication, collaboration, self-management (**Shows how; Year2**). This shared 'hot-spot' highlights that Second year students and their educators believed assessment required students to immediately perform at 'Shows how' level.

Domain 3: Leadership and management (**Knows; Year3 and Does; Year4**)

Domain 5: Prepare pharmaceutical products (**Shows how; Year3**)

Domain 8: Critical analysis, research and education (**Does; Year4**)

Figure 17 suggests the whole curriculum does provide a clear knowledge foundation (particularly in Years 1 and 2), however deeper exploration of the findings (Figure 18 and 19) reveals that some Domains appear to have stronger foundations than others. The number of occasions where Domains 3 and 8 were mapped to summative assessment tasks are shown in Table 21 and can supplement the heat-map findings. For example, according to the educators' mapping on Domain 8 the assessments covered all three corresponding standards (8.1, 8.2, 8.3) on multiple occasions across all four Miller's levels. As Table 21 shows Domain 8 provides greater opportunities for student development. In contrast, according to educators' mapping of summative assessment on Domain 3, students in fourth year are expected to perform at a 'Does' level with much less foundation development.

The TLR data presented in Table 22 also provides an indication of the number of NCS the students were required to combine to successfully complete assessment tasks. Examined with the assessment description it is possible to determine if students were required to integrate the NCS (across and within Domains) at appropriate performance levels. For example the Fourth year assessment task, 'Health Promotion Services Project Report', required students to integrate Domain 2 (Communication, collaboration and self-management) with Domain 6 (Deliver primary preventative healthcare). Then, within Domain 6 itself students also combined standards 6.1, 6.2 and 6.3 to deliver primary preventative care and were assessed by their educators at a 'Does' level (i.e. in the practice setting with clients).

By interpreting the findings from each Table (21, 22) and Figures (17, 18, 19) it is possible to appreciate (i) how the NCS were distributed throughout assessments across the curriculum, (ii) the number of times each Domain had been assessed, (iii) if each competency standard within each Domain was scaffolded throughout assessment from 'Knows' through to 'Does', and (iv) where exactly in the curriculum this took place.

Feedback survey participants represented 45% (73/163), and 16% (31/198) of those invited in Semester 1 and 2, respectively. Student feedback comments are included in the Discussion section to supplement the narrative. Interestingly, in Semester 1 Third year students had the poorest feedback survey response rate (30%) whilst Second year students represented the highest response rate (56%). In Semester 2, Second year students represented the lowest of all year groups (10%).

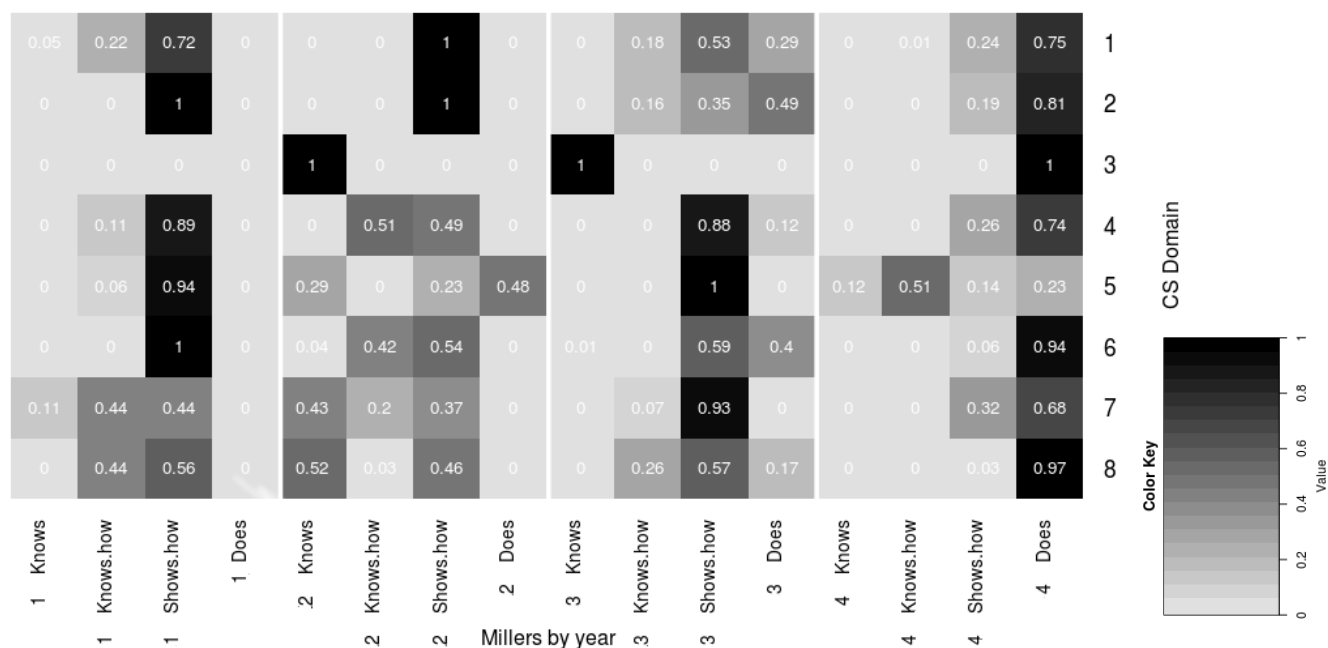


Figure 18. Heat-map of students' self-reflection of performance level on Miller's pyramid for each NCS Domain1 by year

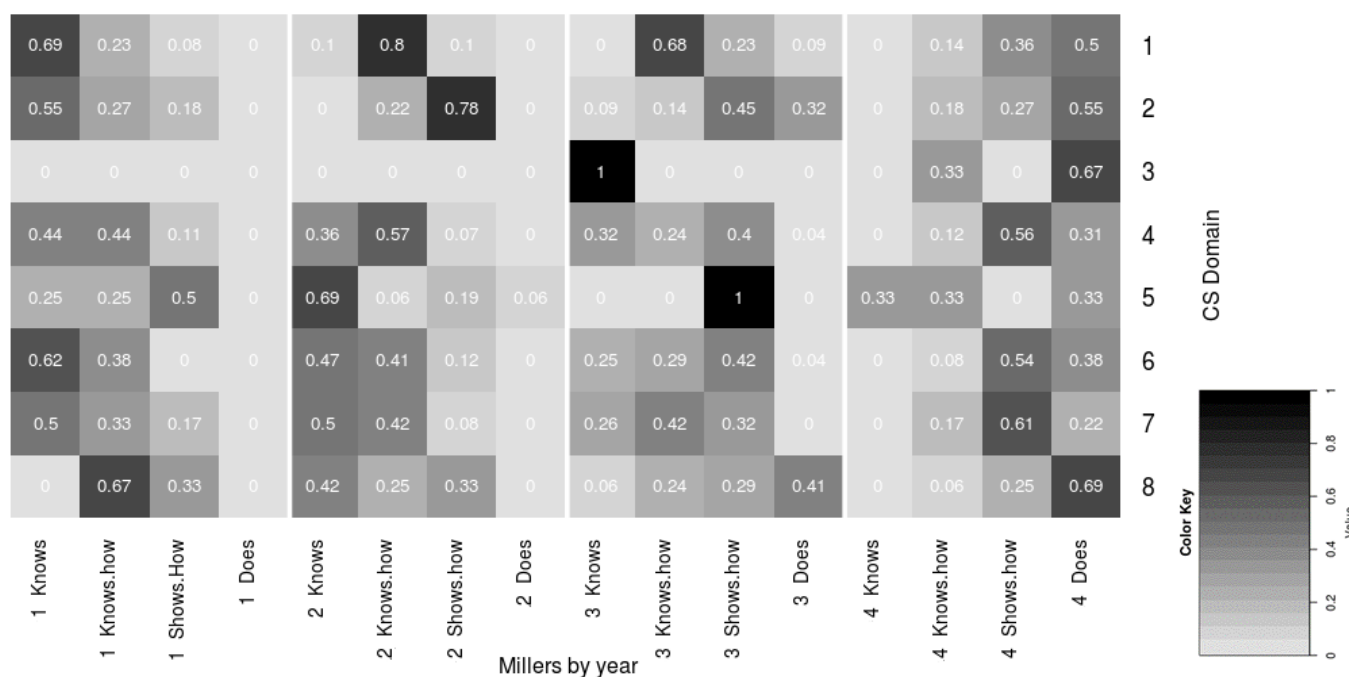


Figure 19. Educators' perspective; Heat Map of expected performance for summative assessment for each NCS Domain by year and Miller's level

¹ NCS Domains; 1. Professional and ethical practice, 2. Communication, collaboration and self-management, 3. Leadership and management, 4. Review and supply prescribed medicines, 5. Prepare pharmaceutical products, 6. Deliver primary and preventative health care, 7. Promote and contribute to optimal use of medicines, 8. Critical analysis, research and education.

Table 21. Distribution of competency standards within Domains 3 and 8, highlighting differences in scaffolding and number of times each standard was addressed in assessment by units and year of enrolment

NCS	NCS Description	Miller's level	Number of assessments corresponding to NCS	Number of units corresponding to NCS	Year of curriculum assessment conducted
Domain 3. Leadership and Management					
3.1	Provide leadership and organisational planning	Does	2	2	4
3.2	Manage and develop personnel	Does	1	1	4
3.3	Manage pharmacy infrastructure and resources	Does	1	1	4
3.4	Manage quality service delivery	Does	1	1	4
		Knows how	1	1	4
3.5	Provide safe and secure work environment	Knows	2	1	3
Domain 8. Critical analysis, research and education					
8	Assessment covers all NCS in Domain 8; 8.1, 8.2, 8.3	Does	5	1	3
				1	4
		Shows how	1	1	2
		Knows how	2	1	2
		Knows	2	2	2
8.1	Retrieve, analyse and synthesise information	Does	15	2	3
				4	4
		Shows how	16	2	1
				2	2
				2	3
				2	4
		Knows how	8	2	2
				3	3
				1	4
		Knows	1	1	2
8.2	Engage in health, medicines or pharmacy practice research	Does	8	2	3
				2	4
		Shows how	4	1	2
		Knows how	2	1	1
				1	2
8.3	Formally educate and train students and healthcare colleagues	Does	6	1	3
				2	4

Table 22. Two example assessments extracted from TLR database highlight First year assessment task requiring limited integration of Domains compared with Fourth year assessment task with advanced integration across/within Domains

First Year Unit: 6 short in-class tests on dosage form theory and calculations		
NCS Domain	Standards	Miller's
1	1.1.1	Knows
5	5.1.3, 5.1.4	
	5.2	Shows how
Fourth Year Unit: Health Promotion Service Project Report		
NCS Domain	Standards	Miller's
2	2.1, 2.3, 2.6	Does
	2.1.1, 2.1.3, 2.1.4	
	2.3.1, 2.3.2, 2.3.3	
	2.6.1, 2.6.2.2.6.3	
3	3.1, 3.2, 3.3, 3.4	
	3.1.2, 3.1.3, 3.1.5	
	3.2.3	
	3.3.1, 3.3.2	
	3.4.1, 3.4.2, 3.4.3	
4	4.2	
	4.2.1, 4.2.2, 4.2.3	
6	6.1, 6.2, 6.3	
7	7.1, 7.2, 7.3	
	7.2.1, 7.2.3, 7.2.4	
8	8.1, 8.3	

7.5 Discussion

Analysis of the TLR highlights two distinct viewpoints of an identical curriculum - those of a cohort of undergraduate pharmacy students and those of their educators. Whilst neither viewpoint should be considered more valid than the other, points of difference and similarity provide valuable insights and a meeting point for discussion of assessment and AoL.

The value of these insights was supported by student comments from the feedback survey;

'Provided useful feedback on particular aspects of the course.' (Second Year, Female19)

'It allowed me to see which areas (of curriculum) are relevant.' (Third Year, Male21)

The authors claim the TLR is novel for two reasons - firstly, because it explicitly presented Miller's pyramid to students for self-reflection purposes, which has not been done previously. Whilst Miller's pyramid has been used for some time by educators to inform assessment plans (Wass, et al. 2001), in progress testing (Szilagyi, 2008) and curriculum review, and to discuss the difficulty (Epstein & Hundert, 2002) and scaffolding (Kleinert et al. 2015) of assessments, the literature does not appear to describe the explicit use of Miller's pyramid with students for self-reflection.

The second point of difference of the TLR was that it directly contrasted the student voice with educator curriculum mapping for AoL. The TLR supersedes traditional educator-led curriculum mapping focussed on the 'intended' or 'assessed' curriculum, which is not always the same as the 'enacted' or 'learnt' curriculum from the students' perspective (Barrie, 2004; Edstrom, 2008; Harden, 2001; Lew, Alwis, & Schmidt, 2010; Porter & Smithson, 2001).

Using this novel approach to AoL, the authors anticipated that the students' self-reflection on the learnt curriculum would align with their educators' mapping of the assessed curriculum, as found by other authors (Porter, Floden, & Fuhrman, 1998, Plaza et al. 2007). However, the TLR did not report similar concordance, as evidenced by poor agreement between educators'

expected performance levels contrasted with their students' reflections, especially when the curriculum was examined for each NCS Domain by year of enrolment. Kelly & Demb (2006) also reported disconnect in student and educators assessment expectations. The TLR may provide professional disciplines with a new solution to AoL. It provides a logical meeting point for students and their educators to ensure assessed curriculum translates to learnt curriculum. The meeting point is at the intersection of student voice with their educators' curriculum mapping captured, reported and contrasted by the TLR. AoL principles impress that a curriculum which is designed with a solid foundation, scaffolded development and opportunities for students to integrate their knowledge, skills and attributes will enhance student success (AACSB International, 2013, Hall & Kro, 2006, Lawson, 2015b). The TLR findings allow exploration of the design of this pharmacy curriculum against these three elements.

Solid foundation

Student success is enhanced if students are provided opportunities to learn foundational knowledge (Knows/Knows how) prior to being required to apply that knowledge in practice (Shows how/Does). Findings from this study, as seen in Figures 17, 18, 19 and Table 21, illustrate that the curriculum provided students with opportunities to develop a strong foundation in some Domains but less so in others. This is particularly evident when contrasting Domains 3 and 8. Some of the unexpected patterns described (e.g. Fourth year students' disagreement with their educators) may be due to conceptual misunderstandings of Miller's pyramid, and the nature of knowledge, itself. This is illustrated by the following student comment:

'I self-assessed at a higher level. I have worked in community pharmacy since first year and I feel/ have been told that I work very competently.' (Third Year, Female21)

Contrasting with this student's statement, by definition, 'Does' requires that the student or practitioner be situated in the practice setting integrating competencies to consistently perform a task. To perform that task safely, practitioners require a strong foundation in the underpinning knowledge of the skills (Miller, 1990; Wass, et al. 2001). A student may believe they are capable to 'do' a task (dispense medicines) but may be doing so without the foundational knowledge (pharmacology and therapeutics) required to do so safely.

With a specific focus on providing students with a solid foundation throughout their curriculum the TLR assists educators to ascertain the AoL of an existent curriculum design.

Scaffolded development

Outcomes-based educators argue for scaffolded development and multiple opportunities to assess competencies (Conway, Medina, Letassy, & Britton, 2011; Epstein & Hundert, 2002; Van Der Vleuten & Schuwirth, 2005; Wass, et al. 2001). Figure 17 portrays a curriculum which generally builds students' capacity to apply their knowledge in practice by Fourth year. This scaffolded course development, described by both students and educators, is reassuring from a whole of curriculum point of view, however the differences between the students' and their educators' expectations at Domain level evidenced in the heat-maps warrants further exploration. The heat-maps may help us to understand how a scaffolded curriculum (represented by summative assessments) might translate to AoL. Through the eyes of students and educators the heat-maps provide evidence of Domains which appear well scaffolded and those which are not. The TLR data were able to demonstrate scaffolding or lack of scaffolding of summative assessments.

The reported disconnect could be a result of differences in interpretation between educators and students or could highlight a need for curriculum restructure. The findings described may indicate some areas of poorly laid foundations, inconsistent scaffolding, or inadequate opportunities for students to integrate knowledge and skills;

'There were many competency standards that I felt I wasn't confident in despite the actual assessment showing that I was.' (Second Year, Male19).

The students' heat-map on Domain 2 (communication, collaboration and self-management) implies students perceived assessment commencing at a Shows How level without assessment of underpinning knowledge development. If educators do not design curriculum to ensure scaffolded development from 'Knows' (for example, the theory of motivational interviewing techniques utilised in smoking cessation) through to 'Does' (e.g. motivational interviewing with a client in practice) this could have negative results for those reliant on communicating with health graduates about their health and medicines.

We now focus again on Domains 3 and 8 shown in Figure 18, 19 and Table 21. Within Domain 8, it is apparent that a graduate has had their knowledge scaffolded and examined repetitively to enable competent performance at a 'Does' level for all standards, however they may be less prepared for performance in Domain 3. From this it is clear that Domain 3 (Leadership and management) may need to be introduced earlier in the course and scaffolded to ensure our graduates can be leaders of the profession. This example evidences the depth and breadth of information the TLR can provide for course review and AoL.

To uphold AoL, students must be provided with clear instructions of assessment expectations and criteria in order to succeed (Biggs & Tang, 2007). Students' difficulty in appreciating the relevance of the NCS may be a consequence of implicit use of the NCS by educators without explicit communication of their relevance to students. The TLR project highlights that there is a significant role for course level rubrics (Lawson, et al. 2015) or (if adopted) TLR rubrics to ensure consistent scaffolding across course assessment. Student understanding of educator expectations may be improved through students' active participation in the rubric development phase. Rubrics may have addressed some of the difficulties experienced by

students, as well as the evidenced disconnect, by ensuring students did not have to assume anything;

'I assume that we are being taught to meet the competency standards therefore by passing assessments I am demonstrating competency.' (Second Year, Female20)

Integrate knowledge, skills and attributes

Pharmacists integrate multiple NCS to competently perform in practice at a 'Does' level. To ensure workplace readiness, a curriculum must also be designed so that students are assessed for their ability to integrate their knowledge, skills and attributes. Harden and Stamper's (1999) spiral design curriculum integrates relevant knowledge, skills and attributes and given the findings described here may be useful for future course redesign efforts. The benefits of integrated curriculum design and authentic assessment have also been discussed by Van Der Vleuten and Schuwirth (2005). The student feedback comments implied a science versus practice split, indicative of potentially poor integration, in the curriculum, particularly amongst First and Second year students. The relationship of the NCS to the curriculum was difficult for some students to appreciate and potentially led to students questioning the relevance of the NCS to their curriculum (and vice versa). This was evidenced in one student's comment;

'The research is great, for me it has highlighted how truly meaningless the competency standards are at the moment. They let me know I'm "tracking" towards competency, still meaningless....I can only assume 3rd year placements will give gravity to the CS and finally allow me to judge myself and the School's curriculum against them..... Without the experience of real life practice (placements or intern) to benchmark the info against, the report doesn't have any meaning to me.' (Second Year, Male31)

Highlighted by the data in Table 22, authentic assessment choice can play an important role in providing students with opportunities to integrate their required competencies, be assessed formally and therefore succeed in practice. The Health Promotion Service Project Report, which involves students on placement designing a health promotion service, delivering it to the community and evaluating it, required students to address multiple Domains and standards within each Domain. Whilst we cannot assume all the NCS listed were integrated by students, the data give us a positive indication that this was the educator's intention. TLR data interpreted alongside assessment task descriptions confirm whether students were required to integrate their knowledge, skills and attributes to succeed in each summative assessment. This provides students about to enter the practice setting with confidence in their ability to perform.

Overall, these findings have implications for students, educators and regulators; students may find it difficult to succeed if their expectations of curriculum are different to those teaching and assessing them and vice-versa. AoL could be sub-optimal, especially as the learnt curriculum appears significantly different to the assessed curriculum at a Domain level. Course accreditation may be approved based on assessed/mapped curriculum which has been evidenced here to be different to learnt curriculum. Overall this may produce a mismatch in graduate knowledge and skills for their workplace requirements.

Limitations and influencing factors

To utilise the TLR findings for AoL it is necessary to be cognisant of three influencing factors affecting students' and educators' perceptions of their curriculum - student and educator familiarity with the NCS, familiarity with Miller's pyramid and self-reflection difficulties.

Poor NCS familiarity across the Australian pharmacy profession, including amongst its educators and students (Nash, et al. 2016; Nash, Chalmers, Stupans, & Brown, 2015), may

have negatively impacted on their ability to apply them in the education setting. As the NCS are action orientated descriptions, the style of assessment and how well this matched the NCS and corresponding Miller's description may have also influenced interpretations. Given the matching 'hot-spots' emerged in instances where students were required to apply their knowledge (Shows how/Does), we can deduce it was easier for students and educators to appreciate the relevance of NCS when the assessment required application of knowledge, rather than acquisition of that knowledge. Finally, some students reported confusion with the self-reflection task. This difficulty can be attributed to self-reflection being a new skill students had not previously encountered in the curriculum, compounded by the fact that students were required to recall multiple assessments that they had completed over the course of a semester and then identify relevant NCS for each. These comments reflect this difficulty;

'It was interesting seeing where the competency standards had been assessed this semester according to my lecturers - I hadn't thought of all the different assessment pieces that were relevant.' (Fourth Year, Female22)

'...useful in my current stage of study to just get the actual assessment because I was not really aware of where each of the competency standards were covered in my units.' (Second Year, Female19)

Furthermore, difficulties in separating a curriculum (as a whole ecosystem) and other activities taking place at the same time (e.g. NCS flow charts introduced into unit outlines) may have confounded results. Voluntary participation, student workload and survey fatigue may have led to low response rates. Participants likely represented more motivated individuals which may bias results.

Recommendations and future research

Resourced appropriately, the TLR may scaffold student development of self-reflection skills. The TLR could also become a very powerful form of feedback to engage and empower students in their learning. It provides a central meeting point for educators and students regarding performance expectations for assessment, as well as offering insights on curriculum design for AoL. To ensure sustained engagement, future TLR versions should be embedded within courses and course teaching team cultures. In fact to maximise educational outcomes students and educators could workshop together to discuss the NCS, assessment expectations and co-design rubrics. If the NCS adequately reflect current pharmacy practice requirements, then the learnt curriculum as evidenced by students' reflections must match the assessed curriculum. Student reflections therefore demand greater consideration in the curriculum review process. Internationally, professional courses could consider a similar approach to curriculum review, harnessing student interpretations to compare directly with their educators' expectations for AoL. A project to determine the TLR's impact on AoL amongst educators and students who meet to discuss their TLR is warranted, as are projects to explore the use of the TLR with other professional disciplines.

7.6 Conclusions

The TLR provides a new technique for evidencing the AoL of a curriculum. In the pharmacy course described, the TLR was able to highlight potential issues with foundation, scaffolding and integration of professional standards within a curriculum. The TLR reinforces the assessed and learnt curriculum may not always be consistent and provides educators and students with a logical meeting point for AoL. Using self-reflection, students can provide rich data reflective of a learnt curriculum useful for examining a course for AoL. This has potential portability to other disciplines with well-defined professional standards.

7.7 References

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Chapter 6. Conclusions

This final chapter will begin with a discussion of the context and relevance of this research.

The findings and recommendations from the preceding four chapters (and their six associated papers) are synthesised by the candidate to answer the overarching question;

What is the impact on students of an educational intervention (Traffic Light Report) which highlights NCS and self-assessment skills in an Australian pharmacy program?

This chapter concludes with future research suggestions generated as a result of these findings.

The early chapters within this thesis provide the pharmacy profession, and in particular pharmacy educators, with useful insight into the current use of the NCS in practice and education. The literature review, surveys and interviews generated data from participant students, pharmacists, pharmacy interns and educators. The findings served two broad purposes; (1) they confirmed the need for an educational intervention for pharmacy undergraduates, and (2) they informed the design of the intervention, the TLR.

Prior to addressing the research question it is necessary to provide some context on the importance of the TLR design elements (NCS and self-assessment skills) for pharmacy undergraduates' learning now and in the future. The International Pharmaceutical Federation (FIP) promote the use of competency standards to

'facilitate education, development and capacity to meet the needs to sustain a pharmacy workforce relevant to country-level needs.' (International Pharmaceutical Federation Pharmacy Education Taskforce, 2012, p. 16).

A jurisdiction's competency standards facilitate education through providing clear standards (the required knowledge, skills and attributes) required either at graduation or upon registration. Pharmacy educators advocate for a "needs based" pharmacy education model

(Anderson et al., 2012), meaning pharmacy courses are aligned with practice requirements. Critical to alignment is educator and student familiarity and meaningful application of their local competency standards. Self-assessment skills, self-reflection skills and informed judgement are critical pedagogical and assessment tools to support students in their current learning and can also support their transition to professional careers (Bourke, 2014; Ronfeldt & Grossman, 2008; Boud 2010). Professional disciplines are increasingly recognising the importance of life-long learning skills development (Ryan, Hanrahan, Krass, Sainsbury, & Smith, 2009), which are now a minimum requirement for all university graduates (Berdrow & Evers, 2011). For public safety, once registered, Australian pharmacists commit to life-long learning and have a mandatory requirement to review (self-assess) their practice against the NCS annually (Pharmacy Board of Australia, 2010) and incorporate the NCS into their CPD plan (Pharmacy Board of Australia, 2015). This review of practice requires self-assessment skills and familiarity with the reference point, in this case the NCS. Practice and early habit formation is important to life-long learning skills development and subsequent use in practice (Boud, 2000; O'Brocta et al., 2012; Sharif, Gifford, Morris, & Barber, 2007; Tofade, Khandoobhai, & Leadon, 2012). Healthcare and the pharmacist's role have and will continually evolve. Professional competencies can catalyse and communicate for practice change (Canadian Pharmacists Association., 2013) and competence frameworks have been proven as useful tools to monitor and improve pharmacy practice performance globally (Atkinson et al., 2014). To deliver on these improvements, tomorrow's pharmacists must be familiar with their competency standards and capable of continually self-assessing their current practice against emergent practice requirements. These requirements are communicated through their profession's regularly renewed competency statements.

Thus familiarity with the NCS and self-assessment skills are vital to student learning and are essential to pharmacist registration requirements; both support the evolution of the pharmacy profession.

The literature review provided the international context highlighting an increased focus on competency standards within a needs based pharmacy curriculum. Internationally, competency standards are utilised for curriculum design and review and inform many aspects of assessment design (including self-assessment, experiential placements, progress testing and annual testing). Driven by course accreditation requirements pharmacy educators had explored various methods for evidencing graduate accomplishment of competency standards. The systematised review captured course-wide exemplars only, examples are now revisited. Plaza et. al. (2007) utilised curriculum mapping for review and accreditation requirements and highlighted concordance in educator and student perceptions of competency domain coverage and thus consistency in the intended and delivered curriculum. Kelley and Demb (2006) utilised a survey tool to compare student and educator perceptions of the delivery and achievement of professional competencies in their PharmD. In the UK, pharmacy students were invited to utilise the General Level Competency Framework as a checklist in their portfolios. Students found this activity useful for identifying gaps in their knowledge and or skills and exhibited student centred learning attitudes essential for future life-long learning (McMahon & Henman, 2007). In Belgium, pharmacy educators found portfolio assessment useful for evidencing student learning course-wide. Collating portfolio evidence facilitated student integration and consolidation of knowledge and skills course-wide, fostered self-directed learning strategies such as self-assessment, provided educators an opportunity to evaluate their course for meaningful learning, whilst also providing accreditation documentation for their course (Petit, Foriers, & Rombaut, 2008). Finally, progress testing enabled educators to evaluate student readiness for experiential placements, learning progress

and determine students' course-wide knowledge retention (Mészáros et al., 2009; Szilagyi, 2008). Pharmacy educators supported the use of competency standards to inform learning and reported competency based education (Bradberry et al., 2007) was complementary to conventional forms of assessment (Hill, Delafuente, Sicat, & Kirkwood, 2006; K Kelley, Beatty, Legg, & McAuley, 2008; McMahon & Henman, 2007). They also highlighted competency based assessment should not rely on one instance or form of assessment (McMahon & Henman, 2007; Mészáros, et al., 2009). Overall, course-wide use of competency standards enabled students and educators to review curriculum for 'fitness of' and 'fitness for' purpose (Krause et al., 2014). The international exemplars informed this research, in particular the rationale and design of the educational intervention, the TLR.

Whilst there were many examples of the course-wide application of competency standards internationally, the review revealed a scarcity of Australian studies reported in the literature between 2000 and 2012. This scarcity led to an investigation of the Australian pharmacy education context. With a focus on pharmacy education, the surveys and interviews were conducted to offer a contemporary insight into the knowledge, use and perceived relevance of the NCS across the whole pharmacy profession and revealed some significant potential deficiencies and barriers. The online surveys revealed that knowledge, familiarity and use of the NCS amongst the Australian pharmacy profession were sub-optimal. The majority of responding pharmacists reported they do not utilise the NCS for annual renewal of registration or for planning their CPD. These findings are important given the mandatory requirement that pharmacists review (self-assess) their practice against the NCS annually and incorporate the NCS into their CPD plan (Pharmacy Board of Australia, 2015). Educators reported poor familiarity with the NCS, whilst only half of the student respondents reported knowledge of the NCS.

When contrasted with the international findings, there were few Australian examples of course-wide use of the NCS such as progress testing or portfolio. In interviews, Australian educators reported they utilised the NCS to inform self-assessment, oral exams, OSCEs and experiential placements. The majority of Australian pharmacy educators reported that they had employed self-assessment learning strategies with their students and in the process made the NCS explicit to their students. This claim however, is at odds with the poor student knowledge of the NCS reported at the same time by student participants in the online survey.

The barriers to the use of the NCS offered by the online survey respondents (pharmacists, students, interns and educators) included the practicality and relevance of the NCS, the document's sheer volume and format and poor awareness of the NCS alongside limited understanding of the role and importance of the NCS amongst the profession. Educators raised similar barriers; they added that use of the NCS in the education context was limited by the fact the NCS describe competent practitioners, not graduates.

Despite many of the pharmacy educators describing difficulties associated with the use of the NCS in their context (with students) there were significant factors which led to the inclusion of the NCS in this research, in particular the importance that future pharmacists have familiarity with their NCS to fulfil their mandatory registration requirements.

The educational intervention (Traffic Light Report) was inspired by the findings from the literature review, online surveys and the pharmacy educator interviews. The specific inspirations included;

- international exemplars of program-wide use of competency standards for curriculum design, assessment and review;
- the finding that Australian pharmacists reported they do not utilise the NCS for renewal of annual registration or for planning CPD;

- the poor knowledge, use and perceived relevance of the NCS reported profession-wide, particularly amongst students and
- the Australian pharmacy educators reported barriers to the use of the NCS in higher education, in particular the questionable relevance of the NCS to students in their learning context.

The findings in conjunction with the international exemplars uncovered by the review had direct influence on the TLR design. Consequently the TLR was designed with three essential components; NCS, Miller's pyramid of clinical competence and the traffic light scale. The TLR aimed to improve student familiarity with the NCS whilst also providing students with an opportunity to develop self-assessment skills.

The TLR led to four immediate outcomes for student participants.

The first outcome was a statistically significant increase in student acceptance that the NCS were relevant to them in the education context. This may be a direct consequence of the use of Miller's pyramid to provide students with a competence continuum. Miller's pyramid offers a solution to the educator identified limitation that NCS are written for pharmacists, not graduates. Combining the NCS with Miller's pyramid for use in the education context provides a student/practitioner with a 'scaled' competence continuum, which is important to realising the goals of our maturing profession (Coombes, Bates, Duggan, & Galbraith, 2011).

The second outcome was the self- assessment skills development opportunity the TLR provided to participating students. The data on the traffic light scale enabled a comparison of educator and student predicted grade of assessment. Grade prediction accuracy was employed as the measure of self-assessment skills development. Grade prediction as a measure of self-assessment accuracy has limitations. Grade prediction has been found to be a poor measure of self-assessment skills development (Boud, Lawson, & Thompson, 2013) due to self-

assessment being a complex construct (Sargeant et al., 2010) influenced by many factors (Falchikov & Boud, 1989) difficult to control for in an education setting. For example, accuracy assumes that the comparison point or ‘educators’ perspective’ was correct or perfect; as reported elsewhere this is not always the case (Falchikov & Boud, 1989). The educator perspective may be imperfect due to poor educator familiarity with the NCS (as reported in the surveys and interviews) and educators’ mapping the curriculum in isolation which impacts the reliability of the educator data (Lawson, 2014). Despite this, the self-assessment and informed judgement skills practice provided by the TLR led to a statistically significant improvement in student and educator consistency from Semester 1 to Semester 2.

The third outcome was unexpected and provides indirect benefits to student learning. The TLR data, with specific focus on Miller’s pyramid, provided educators with a lens to understand curriculum design and inform curriculum review for quality enhancement.

Students and educators utilised Miller’s pyramid to communicate the expected performance level of assessment tasks. Presenting the Miller’s pyramid data in two ways; (1) as a course-wide summary of performance levels of assessment, and (2) as patterns of assessment performance levels relevant to each individual competency domain (heat maps), provided different insights.

The course-wide summary revealed that, in general, the curriculum assessed students in first and second year predominantly on the acquisition of knowledge (knows/knows how), but by third and fourth year this changed to the application of knowledge (shows how/does). This finding complies with the needs based pharmacy education model (Anderson, et al., 2012), is consistent with development of declarative ‘university’ knowledge to ‘professional’ or functioning knowledge (Biggs & Tang, 2011) and provides reassurance the curriculum provides a solid foundation, scaffolded development and integration for Assurance of Learning (AoL) (Lawson, 2014). The finding provides educators with reassurance that,

overall, students have been provided a solid foundational knowledge base before being required to apply knowledge in practice and learning has been scaffolded. In addition, within this data there was consistency between students and educators' expectations of performance level across all year groups, with the exception of fourth year. This is consistent with what has been described elsewhere (Falchikov & Boud, 1989), whereby more experienced students tended to underestimate their performance. Triangulation of the two sources of data found consistency in educator and student interpretations of performance levels which provides reassurance on the reliability of the educator mapping and student self-assessment data.

The presentation of assessment performance levels relevant to each individual competency domain in heat maps highlighted that some individual competency domains (e.g. communication, collaboration and self-management) were scaffolded in a more appropriate manner than others (e.g. leadership and management). At a domain level students in the latter years of the course and those who repeated the TLR activity exhibited greater consistency with educator expectations, which was consistent with the literature (Belski & Belski, 2013; Boud & Falchikov, 2005; Bourke, 2014; Falchikov & Boud, 1989; Leach, 2010; Lopez & Kossack, 2007; Mumm, Karm, & Remmik, 2015). The TLR data on Miller's pyramid provides students and educators with an opportunity to discuss the similarities and differences in their expectations for AoL. Elsewhere this disconnect is described as the intended, taught and learnt curricula (Barrie, 2004; Edstrom, 2008; Harden, 2001; Lew, Alwis, & Schmidt, 2010; Porter & Smithson, 2001). The TLR provided a novel approach and brought student and educator perspectives of the same assessed curriculum together to facilitate a discussion around curriculum and assessment designed for the AoL.

The fourth outcome was mixed student acceptance of the TLR intervention. Whilst students accepted the usefulness of the TLR, most were not convinced it would change their approach to learning in the future. This may be better understood through appreciation of the complex

processes and dimensions of informed self-assessment (Sargeant et al., 2011). There are a number of factors which may have influenced this finding. Sub-optimal student knowledge of the NCS reported pre-initiative may have led to difficulty in application as familiarity with the standards being applied is essential for self-assessment (Sargeant, et al., 2010). The self-assessment tool utilised by students had three components - a simpler self-assessment scale may have aided usability and acceptance amongst students. Specific self-assessment skills development sessions may have also improved student experience and acceptance. However, the difficulty students reported is consistent with pharmacy education literature, which describes self-assessment accuracy as problematic for both students (Austin & Gregory, 2007; Dyke, Gidman, Wilson, & Becket, 2009) and registered pharmacists (Laaksonen, Bates, & Duggan, 2007; Pflieger, McHattie, Diack, McCaig, & Stewart, 2008).

The lessons learnt from the TLR educational intervention arise from its design, implementation, delivery and subsequent analysis. The lessons can be summarised as:

Lesson 1. Assessment is subjective. Consider measures to reduce subjectivity including course-wide calibration of assessment and explicit communication of expectations.

Lesson 2. Embed the NCS and self-assessment skills in the curriculum.

Lesson 3. Engage educators in pedagogy, curriculum design and curriculum mapping.

Lesson 4. Ensure technology and techniques are appropriate and supported.

In summary, future TLR versions could be improved if a teaching team approach was employed (Lawson, 2014, 2015; Lawson et al., 2015). This is achievable with a top-down/bottom-up engagement strategy (Fullan & Scott, 2009, 2014). The process of curriculum mapping is considered much more valuable than the product (Kelley, McAuley, Wallace, & Frank, 2008; Lawson, 2014, 2015; Lawson et al., 2013; Lawson, et al., 2015). To obtain full benefit mapping strategies should be *'holistic, integrative, collaborative and*

maintainable' (Lawson, 2014, p. 12). An embedded design, including course-wide scaffolding of self-assessment skills and a course-wide philosophy and culture of life-long learning may improve student outcomes and sustainability. Course-wide rubrics (Lawson, 2014, 2015) and criterion referenced assessment (Biggs & Tang, 2011; Hill, et al., 2006) can ensure calibration and communication of assessment expectations course-wide.

Valuable additions to the TLR could include student self-assessment workshops, more opportunities for student and educator clarification on TLR elements during the project, and individual student TLR debrief meetings to discuss TLR results and learn with and from peers, educators or mentors (Merriam & Bierema, 2013). Integration of the TLR with existing course learning activities (tutorials and placements) and the learning management system may improve outcomes and acceptance. Supported by literature on the many uses for e-Portfolio in higher education, (Chen, 2015; Chen, Grocott, & Kehoe, 2016; Kahn, 2014; Kehoe, 2015; Kehoe & Goudzwaard, 2015; Oliver, von Konsky, Jones, Ferns, & Tucker, 2009; Oliver & Whelan, 2011; Reese & Levy, 2009) potential future application may include personalised student learning plans informed by TLR results and e-Portfolio evidence to underpin each student's TLR summary.

Existent barriers to the use of the NCS in practice and education such as poor familiarity profession-wide might be resolved through thoughtful dissemination and education strategies which coincide with the release of renewed standards.

To conclude, competency standards hold little value if they are not utilised as intended. Learnt content has a use-by date, self-assessment skills last a lifetime. The appropriate education and assessment of future pharmacists is crucial to the subsequent use of the NCS in their practice, particularly at critical times such as when planning their CPD and at annual renewal of registration. This research found that an educational intervention designed for students in their context could improve student acceptance of the relevance of their NCS

whilst also providing students with an opportunity to practice self-assessment skills. It also provided educators and students with a novel technique to review their course for AoL. This has implications for pharmacy students, pharmacy educators, pharmacists, regulators, the profession and the public, and also has transferability to other professional disciplines with defined competency standards.

Future Research

A repeat of the surveys and interviews would facilitate a comparison of the use of 2010 NCS with the renewed version due for release in 2016. Collating this information would aid the evaluation of future NCS versions to optimise implementation strategies and the NCS content. The professionalism scale included in the survey had poor associated response rates. This section of the survey could be repeated separately with the same groups (pharmacists, students, educators interns and preceptors) as well as international groups as an interesting for comparison.

This research could be periodically repeated to provide a mechanism for all pharmacy stakeholders including educators to inform the usability of the NCS.

As the findings highlight, more needs to be done to determine what best promotes ‘visible skills’ including self-assessment. Further research is required to establish the importance of self-assessment for pharmacy student and practitioner learning and to explore whether students and practitioners have these skills or if they need to be taught. Given that grade prediction has limitations for the measurement of self-assessment, studies are required to compare and validate alternate methods. Research to determine how learning analytics may assist educators to track student self-assessment skills development over time may lead to advances in education for the professions.

Many students who participated in the TLR have now dispersed nationally and internationally post-graduation, however, retrospective focus groups or interviews to explore why these students did not feel the TLR would change their approach to learning would be invaluable.

The evaluation of the TLR was limited to its short-term impact, specifically its effect on NCS knowledge and self-assessment skills. Alternate measures such as student participants’ academic success throughout the undergraduate course, professionalism measures,

compliance with CPD requirements and career satisfaction may be future considerations to address possible longer term outcomes. There is also potential for a longitudinal TLR project facilitated by the recent implementation of a continuously updated, course-wide curriculum blueprint designed for the course's 2016 professional accreditation. The database is heavily informed by the TLR approach and was originally populated with the TLR data. A longitudinal study to determine the effect of the TLR on student learning from first through to fourth year and post-graduation into their internship and beyond would provide useful insights on the long term effects of the learning strategies encouraged by the TLR.

The interviews, surveys and educational intervention described in the thesis could be replicated internationally to provide a comparison to the Australian findings. This research also has transferability to other professional degrees that have defined competency standards. Other professional disciplines could benefit from adopting a similar approach to ensure a reciprocal relationship between their profession, their standards and their educators.

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Appendices

Appendix 1. Paper 2; Online Survey Questions for key stakeholders in Australian Pharmacy.

1.1 Pharmacist survey

NB.*starred questions were repeated with other stakeholder groups.

Demographics

1. Age:
2. Gender: **M/F**
3. *Single Professional Organisation you most closely identify with
PSA/SHPA/Guild/AACP/PDL/Other
4. *Location (Post code of workplace)(Optional):
5. ITP you trained under (Optional): **PSA/Guild/NAPE/Other**
6. University of Study (Optional):
7. Other Study or Qualifications(e.g. Masters in Clinical Pharmacy, Graduate Certificate, HMR Accredited):
8. Registered Pharmacist: **YES/NO** (If NO go to Q 15)
9. Years of Practice since graduation: 1-2□ 2-5□ 5-6□ 6-10□ 10-15□ 15+□
Please use the comment box to break down your years of practice eg. 3 years in community pharmacy, 5 years as university educator or explain portion (part time or full time).
10. Currently practising: **YES/NO** (If NO go the Q15)
11. Area of Practice? **Academia Research Intensive/Academia Teaching Intensive/Hospital/ Community/ Accredited Pharmacist**
12. Hours/week (paid).....
13. Intern mentor in last 2 years? **YES/NO**
14. Current role (s) in pharmacy? **Locum/Pharmacy Manager/Pharmacy Owner/Pharmacist/Clinical Pharmacist/HMR Pharmacist/ Other**

Survey

15. *I am familiar with the following documents/resources;

Standards/Framework	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
National Competency Standards Framework for Pharmacists in Australia					
Professional Practice Profile for Initial Registration as a Pharmacist					
Australian Qualifications Framework					
Science, Vet, Health Threshold Learning Outcomes					
Office of Learning and Teaching (OLT) Pharmacy Threshold Learning Outcomes					
Pharmacy Learning Resource database					

16. *For the remainder of the survey the Competency Standards Framework for Australian Pharmacists will be referred to as the Competency Standards. Do you know what these are? **YES/NO/UNSURE**
17. *Describe in your own words what the Competency Standards Framework for Australian Pharmacists mean to you.
18. *Have you accessed the Competency Standards document? **YES/NO/UNSURE**
- 18a) *If **YES**; What format did you use; **Hard Copy** ☐ **Online** ☐ **Both** ☐ **Unsure** ☐
- 18b) *If **YES**; How often in the last year? **Nil** ☐ **Once** ☐ **Twice** ☐ **Weekly** ☐ **Monthly** ☐
19. *Do you think the Competency Standards are relevant to you now? **YES/NO/UNSURE**
20. *Do you think the Competency Standards will be relevant to you in the future?
YES/NO/UNSURE
21. Do you refer to the Competency Standards to compile your continuing professional development (CPD)? **YES/NO/UNSURE**
- 19a) Can you describe any Barriers to using the Competency Standards in your practice? (eg. acceptance, awareness, format, volume or number of standards)
- 19b) Can you think of any Enablers to using the Competency Standards in your practice? (e.g. re-registration requirement , previous exposure in training, defined measurable framework, integrates knowledge, skills & attitudes)
22. How do you use the competency standards currently? **Construct continued professional development (CPD) Plan/For annual renewal of registration/ Reference/ Other**
23. Which of the following options best describe how do you store your continued professional development (CPD) activities currently? **Electronic/ Paper based/ Self-recorded/ PSA website/ Guild/ e-Portfolio/ Other**
24. In your own experience as a student do you feel the Competency Standards were introduced to students in the undergraduate or masters programs? **YES/NO/UNSURE**
Please feel free to add a comment:
25. In your own experience as an intern/training pharmacist do you feel the Competency Standards informed the intern training program you participated in? **YES/NO/UNSURE**
Please feel free to add a comment:
26. In your experience do you think current undergraduate pharmacy students are familiar with the Competency Standards? **YES/NO**
27. *The following statements refer to various aspects of your practice. I am most interested in obtaining your candid opinions to these statements. Please choose one of five possible responses for each statement about continued competency:

Professionalism Question	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
I can maintain an acceptable standard of practice without attending continuing education programs					
Continuing education such as self-study or seminars is essential for my work.					
My daily practice is all the continuing education I need.					
I would attend continuing education seminars only if they were required for relicensure.					
Continuing education is of little importance to my practice					

My practice would suffer if I did not attend continuing education programs.					
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Adapted from Schack D, C Hepler. Modification of Hall's Professionalism Scale for Use with Pharmacists. American Journal of Pharmacy Education. 1979; 43: 98-104.

28. Given the option, which format would you prefer to receive information about perspective intern(s) or new pharmacists to your practice or workplace; **Written CV/ Emailed CV/ e-Portfolio Link/ Other**

1.2 Pharmacy preceptor survey

Demographics

1. Role(s):
2. Qualifications:
3. Registered Pharmacist: YES/NO (* If NO go to Q 10)
4. Years of Practice:
5. Currently practising: YES/NO (*If NO go the Q10)
6. Area of Practice Academia ☐ Hospital ☐ Community ☐ Other ☐
7. Hours/week (paid).....
8. Preceptor for.....years
9. Current number of interns mentoring?
10. Single Professional Organisation you most closely identify with.....
11. Location (Post code of work Location)(optional):

Survey

12. I am familiar with the following documents/resources;

Standards/Framework	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
National Competency Standards Framework for Pharmacists in Australia					
Professional Practice Profile for Initial Registration as a Pharmacist					
Australian Qualifications Framework					
Science, Vet, Health Threshold Learning Outcomes					
OLT Pharmacy Threshold Learning Outcomes					

13. Have you in the past or do you currently refer to following Standards or Frameworks in your mentoring?

Standards/Frameworks	Past		Present	
	Yes	No	Yes	No
Competency Standards				
University Graduate Attributes				
OLT Health, Vet Science TLOs				
OLT Pharmacy TLOs				
Australian Qualifications Framework				
Indicative Curriculum				
Other				
Unsure				

14. For the remainder of the survey the Competency Standards Framework for Australian Pharmacists will be referred to as the Competency Standards. Can you describe these in your own words? **YES/NO**

13a) Description.....

15. Do you refer to the Competency Standards in your role as a preceptor? **YES/NO**

15a) Can you describe any Barriers?

15b) Can you think of any Enablers?

16. Do you think your intern is/are familiar with the Competency Standards? **YES/NO**

17. If you are an actively practising pharmacist do you refer to the Competency Standards in your own CPD? **YES/NO**

18. The following statements refer to various aspects of your practice. I am most interested in obtaining your candid opinions to these statements. Please choose one of five possible responses for each statement about continued competency:

Question	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
I can maintain an acceptable standard of practice without attending continuing education programs					
Continuing education such as self-study or seminars is essential for my work.					
My daily practice is all the continuing education I need.					
I would attend continuing education seminars only if they were required for relicensure.					
Continuing education is of little importance to my practice					
My practice would suffer if I did not attend continuing education programs.					

Adapted from Schack D, C Hepler. Modification of Hall's Professionalism Scale for Use with Pharmacists. American Journal of Pharmacy Education. 1979;43:98-104.(Schack, 1979)

19. How do you use the competency standards currently?

- a) Construct CPD Plan
- b) Tick the box at registration
- c) Reference

20. How often do you refer to them in a year?

- a) Not at all
- b) Once or twice
- c) Monthly
- d) Weekly

21. Does your intern currently use e-Portfolio in their learning? **YES/NO**

If YES, how would you describe its use;

- a) Structured?- Using a Professionalism Framework
- b) Assessed?- Formative/Summative/Both
- c) Course level Assessment or use within individual units?
- d) If it contributes to students marks Is it weighted heavily? What percentage of course/unit?

- e) Do you currently use a Criterion Referenced Assessment (CRA) to assess reflection/e-Portfolio entries?
 - f) Are the learning activities or assessments linked to ILOs, CS, TLOs, grad attributes?
22. Which of the following options best describe how do you store your CPD activities currently;
- a) electronic
 - b) paper-based
 - c) Self recorded
 - d) PSA website
 - e) Guild
 - f) e-Portfolio
 - g) Other.
- Describe.....

1.3 Pharmacy educator survey

Demographics

1. Role(s)
2. Qualifications:
3. Registered Pharmacist: YES/NO (* If NO go to Q 9)
4. Years of Practice:
5. Currently practising: YES/NO (*If NO go the Q9)
6. Area of Practice Academia ☐ Hospital ☐ Community ☐ Other ☐.....
7. Hours/week (paid).....
8. Courses you teach into currently: Bachelor/Masters/Both
9. Single Professional Organisation you most closely identify with.....
10. Location (Post code of work Location)(optional):

Survey

11. I am familiar with the following documents/resources;

Standards/Framework	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
National Competency Standards Framework for Pharmacists in Australia					
Professional Practice Profile for Initial Registration as a Pharmacist					
Australian Qualifications Framework					
Science, Vet, Health Threshold Learning Outcomes					
OLT Pharmacy Threshold Learning Outcomes					
Pharmacy Learning Resource database					

12. Have you in the past or do you currently refer to the following Standards or Frameworks in your teaching?

Standards/Frameworks	Past		Present	
	Yes	No	Yes	No
Competency Standards				
University Graduate Attributes				
OLT Health, Vet Science TLOs				
OLT Pharmacy TLOs				
Australian Qualifications Framework				
Indicative Curriculum				
Other				
Unsure				

13. For the remainder of the survey the Competency Standards Framework for Australian Pharmacists will be referred to as the Competency Standards. Can you describe these in your own words? **YES/NO**

13a) Description.....

14. Do you refer to the Competency Standards in your teaching? **YES/NO**

- 14a) Can you describe any Barriers?
- 14b) Can you think of any Enablers?
15. Do you think your students are familiar with the Competency Standards? **YES/NO**
16. If you are an actively practising pharmacist do you refer to the Competency Standards in your own CPD? **YES/NO**
17. The following statements refer to various aspects of your practice. I am most interested in obtaining your candid opinions to these statements. Please choose one of five possible responses for each statement about continued competency:

Question	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
I can maintain an acceptable standard of practice without attending continuing education programs					
Continuing education such as self-study or seminars is essential for my work.					
My daily practice is all the continuing education I need.					
I would attend continuing education seminars only if they were required for reregistration.					
Continuing education is of little importance to my practice					
My practice would suffer if I did not attend continuing education programs.					

Adapted from Schack D, C Hepler. Modification of Hall's Professionalism Scale for Use with Pharmacists. American Journal of Pharmacy Education. 1979;43:98-104.(Schack, 1979)

17. How do you use the competency standards currently?
- Construct CPD Plan
 - Tick the box at registration
 - Reference
 - Other?
18. How often do you refer to them in a year?
- Not at all
 - Once or twice
 - Monthly
 - Weekly
19. Do your students currently use e-Portfolio in their learning? **YES/NO**
- If YES, how would you describe its use;
- Structured?- Using a Professionalism Framework
 - Assessed?- Formative/Summative/Both
 - Course level Assessment or use within individual units?
 - If it contributes to students marks Is it weighted heavily? What percentage of course/unit?
 - Do you currently use a Criterion Referenced Assessment (CRA) to assess reflection/e-Portfolio entries?

Are the learning activities or assessments linked to ILOs, CS, TLOs, grad attributes?

1.4 Student survey

Demographics

1. Age:
2. Sex M/F:
3. Single Professional Organisation you most closely identify with.....
4. Location (Post code of University)(optional):
5. Course currently studying: Bachelor/Masters/Other
6. Prior Study/Other Qualifications:

Survey

7. I am familiar with the following documents/resources;

Standards/Framework	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
National Competency Standards Framework for Pharmacists in Australia					
Professional Practice Profile for Initial Registration as a Pharmacist					
Australian Qualifications Framework					
Science, Vet, Health Threshold Learning Outcomes					
OLT Pharmacy Threshold Learning Outcomes					

For the remainder of the survey the Competency Standards Framework for Australian Pharmacists will be referred to as the Competency Standards.

8. Do you know what the Competency Standards are? **YES/NO/UNSURE**
9. Can you describe these in your own words? **YES/NO/UNSURE**
9a) Description.....
10. Have you accessed the competency Standards document? **YES/NO/UNSURE**
10a) If **YES**; Format used; **Hard Copy** ☐ **Online** ☐ **Both** ☐ **Unsure** ☐
10b) If **YES**; How often? **Nil** ☐ **Once** ☐ **Twice** ☐ **Weekly** ☐ **Monthly** ☐
11. Do you learn about the Competency Standards in your course work currently?
YES/NO/UNSURE
12. Do you think the Competency Standards are relevant to you now?
YES/NO/UNSURE
13. Do you think the Competency Standards will be relevant to you in the future?
YES/NO/UNSURE
14. Do you refer to the Competency Standards to chart your own progress?
YES/NO/UNSURE
14a) If **YES**; How many times did you refer to the competency standards throughout the year? **Nil** ☐ **Once** ☐ **Twice** ☐ **Weekly** ☐ **Monthly** ☐

15. Have you used the Experiential Placements Self- Assessment tool?

YES/NO/UNSURE

16. Do you feel the Competency Standards are a reference point for academics in the development of the Pharmacy curriculum? **YES/NO/UNSURE**

17. The following statements are used to measure professionalism. I am most interested in obtaining your candid opinions to these statements. Please choose one of five possible responses for each statement:

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I do not expect anything in return when I help someone.					
I attend class daily					
If I realise that I will be late, I contact the appropriate individual at the earliest possible time to inform them.					
If I do not follow through with my responsibilities, I readily accept the consequences.					
I want to exceed the expectation of others.					
It is important to produce quality work.					
I complete my assignments independently and without supervision.					
I follow through with my responsibilities					
I am committed to helping others					
I would take a job where I felt I was needed and could make a difference even if it paid less than other positions.					
It is wrong to cheat to achieve higher rewards (ie grades, money)					
I would report a medication error even if no one else was aware of the mistakes.					
I am able to accept constructive criticism.					
I treat all patients with the same respect, regardless of perceived social standing or ability to pay.					
I address others using appropriate names & titles.					
I am diplomatic when expressing ideas & opinions					
I accept decisions of those in authority.					
I am respectful to individuals who have different backgrounds than mine.					

Chisholm et al. American Journal of Pharmaceutical Education 2006; 70 (4) Article 85. (Chisholm, Cobb, Duke, McDuffie, & Kennedy, 2006)

1.5 Intern pharmacist survey

Demographics

1. Age:
2. Sex M/F:
3. Single Professional Organisation you most closely identify with.....
4. Location (Post code of workplace)(Optional):
5. ITP (Optional): PSA ☐ Guild ☐ NAPE ☐ Other ☐
6. Prior Study/Other Qualifications:

Survey

7. I am familiar with the following documents/resources;

Standards/Framework	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
National Competency Standards Framework for Pharmacists in Australia					
Professional Practice Profile for Initial Registration as a Pharmacist					
Australian Qualifications Framework					
Science, Vet, Health Threshold Learning Outcomes					
OLT Pharmacy Threshold Learning Outcomes					

For the remainder of the survey the Competency Standards Framework for Australian Pharmacists will be referred to as the Competency Standards.

8. Do you know what the Competency Standards are? **YES/NO/UNSURE**
9. Can you describe these in your own words? **YES/NO/UNSURE**
 - 9a) Description.....
10. Have you accessed the Competency Standards document? **YES/NO/UNSURE**
 - 10a) **If YES**; Format used; **Hard Copy** ☐ **Online** ☐ **Both** ☐ **Unsure** ☐
 - 10b) **If YES**; How often? **Nil** ☐ **Once** ☐ **Twice** ☐ **Weekly** ☐ **Monthly** ☐
11. Do you think the Competency Standards are relevant to you now?
YES/NO/UNSURE
12. Do you think the Competency Standards will be relevant to you in the future?
YES/NO/UNSURE
13. Do you refer to the Competency Standards to chart your own progress?
YES/NO/UNSURE
 - 14a) **If YES**; How many times did you refer to the competency standards throughout the year? **Nil** ☐ **Once** ☐ **Twice** ☐ **Weekly** ☐ **Monthly** ☐
14. Have you used the Experiential Placements Self- Assessment tool?
YES/NO/UNSURE
 - 14a) How often have you used the Tool?
Nil ☐ **Once** ☐ **Twice** ☐ **Weekly** ☐ **Monthly** ☐ **Other** ☐

14b) If YES, Choose one response for each of the following statements;

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My preceptor assesses me on the tool					
I self -assess using the tool					
We both assess using the tool					
We discuss the results					
We use the tool to gauge my progress					

15. Do you feel the Competency Standards are a reference point for intern training providers in the development of the Intern Program? **YES/NO/UNSURE**

16. The following statements are used to measure professionalism. I am most interested in obtaining your candid opinions to these statements. Please choose one of five possible responses for each statement:

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I do not expect anything in return when I help someone.					
I attend work daily					
If I realise that I will be late, I contact the appropriate individual at the earliest possible time to inform them.					
If I do not follow through with my responsibilities, I readily accept the consequences.					
I want to exceed the expectation of others.					
It is important to produce quality work.					
I complete my assignments independently and without supervision.					
I follow through with my responsibilities					
I am committed to helping others					
I would take a job where I felt I was needed and could make a difference even if it paid less than other positions.					
It is wrong to cheat to achieve higher rewards (ie grades, money)					
I would report a medication error even if no one else was aware of the mistakes.					

I am able to accept constructive criticism.					
I treat all patients with the same respect, regardless of perceived social standing or ability to pay.					
I address others using appropriate names & titles.					
I am diplomatic when expressing ideas & opinions					
I accept decisions of those in authority.					
I am respectful to individuals who have different backgrounds than mine.					

Chisholm et al. American Journal of Pharmaceutical Education 2006; 70 (4) Article 85. (Chisholm, et al., 2006)

1.6 Survey card (distributed at 2013 pharmacy conference, through professional organisations and social networking sites)

How do pharmacy educators ensure the competency and employability of future pharmacists?

Go in the draw to WIN an iPad mini


All you have to do is take 5 minutes to fill in the online survey, that is applicable to you:

 Pharmacy Student http://goo.gl/gXQn2p	 Practicing Pharmacist http://goo.gl/52t7xP
 ITP Preceptor http://goo.gl/XDPWnd	 University Educator http://goo.gl/ymZ52v
 Pharmacy Intern http://goo.gl/Pp13TV	

Your response will be used to inform the "Use, Knowledge and Acceptance of Australian Competency Standards Framework for Pharmacists and other Pharmacy Education Outcomes in Australian Pharmacy Education".

This study will form a part of Rose Nash's PhD research at the University of Tasmania.

NB: Your mobile device may not support the survey



The research team involved in the project comprises of all UTAS staff; Prof Gregory Peterson (Chief Investigator), Dr Natalie Brown (Co-Supervisor), Dr Leanne Chalmers (Co-Supervisor), Dr Shane Jackson (Co-Supervisor) and Mrs Rosie Nash (PhD Student). If you have any questions about the study, please do not hesitate to contact Rosie Nash at Rose.McShane@utas.edu.au or call on (03)62261095 or contact Gregory Peterson at Gregory.Peterson@utas.edu.au or call on (03)62262197.

Appendix 2. Paper 3; Phone Interview guide (HoS /PE /ITPC)

2.1 Invitation email sent to HoS and PE interview participants

*How do we ensure the competency and employability of our future pharmacy graduates?
How do we currently meet our institution's accreditation needs? Is there a way of making
this process easier for ourselves?*

Dear.....

We would appreciate a 10 minute phone interview or brief discussion at APSA with you regarding the current use of outcomes based assessments, competency standards and evidencing these for accreditation. We value your experience and views on pharmacy education today.

Your response will be used to inform the “Use, Knowledge and Acceptance of Australian Competency Standards Framework for Pharmacists and other Pharmacy Education Outcomes in Australian pharmacy education”. This study will form a part of Rose Nash’s PhD research.

If you wish participate in the phone interview please respond to this email. If you feel there is a more suitable representative in your faculty or school please forward this email to them.

Please nominate three potential dates with times suitable for a phone interview.

If you will be at APSA 2013 in Dunedin I would love to meet with you in person there.

Please let me know a suitable time or the best way to contact you.

We appreciate your participation. Thank you for your time and for contributing to my PhD research.

For further information or to request access to the results of this survey please do not hesitate to contact Rosie Nash at Rose.McShane@utas.edu.au or call on (03)62261095 or

0400341758

2.2 Interview guide

Demographics

1. Role: Hos/Pharmacy Educator/Academic Designer/Dean Learning & Teaching/ Intern Training Program Co-ordinator
2. Single Professional Organisation you most closely identify with.....
3. University/ITP (optional):
4. Other Roles/Qualifications:
5. Registered Pharmacist: YES/NO (* If NO go to Q 10)
6. Years of Practice:
7. Currently practising: YES/NO (*If NO go the Q10)
8. Area of Practice Academia ☐ Hospital ☐ Community ☐ Other ☐
9. Hours/week (paid).....Hours/week (actual)
10. Courses Offering: Bachelor/Masters/Both
11. Staff and Student numbers;

Position	Number of Staff	Number of Students
HoS		
ITPC		

Interview Questions For the purpose of this interview I will refer to the Australian Competency Standards Framework for Pharmacists (2010) as the Competency Standards.

12. Can you tell me briefly what you understand these to be? YES/NO (* If NO go to Q15)

12a) Description.....

13. Do you use the Australian Competency Standards Framework for Pharmacists to inform to design of your pharmacy curriculum? YES/NO

If NO;

- a) Do you wish to? Yes/No
- b) No: Why not? Yes: Why?

If YES;

- a) Can you describe the use?

14. The literature describes the most common use of the Competency Standards in Pharmacy Education to include curriculum design. Of the following which do you feel you use in your course currently?

- a) Design/Review Curriculum
- b) Students Self- Assessment (e.g. Experiential placement tool)
- c) Accreditation Requirement
- d) Assessment (OSCEs)
- e) Assessment (Oral Exam)
- f) Portfolio/ e-Portfolio
- g) Other?
- h) Unsure

- 14a) Can you describe any Barriers?

.....

- 14b) Can you think of any Enablers?

.....

15. I am familiar with the following documents/resources

Standards/Framework	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
National Competency Standards Framework for Pharmacists in Australia					
Professional Practice Profile for Initial Registration as a Pharmacist					
Australian Qualifications Framework					
Science, Vet, Health Threshold Learning Outcomes					
OLT Pharmacy Threshold Learning Outcomes					
Pharmacy Learning Resource database					

16. Have you in the past or do you currently map the curriculum to the following Standards or Frameworks?

Standards/Frameworks	Past		Present	
	Yes	No	Yes	No
Competency Standards				
University Graduate Attributes				
OLT Health, Vet Science TLOs				
OLT Pharmacy TLOs				
Australian Qualifications Framework				
Indicative Curriculum				
Other				
Unsure				

(*If answers to Q16 all NO go to Q17)

- What, if any software was used in the process?
- Do you consider data stored in the software/database to be live (explanation: current and continuously updated)? YES/NO
- Who is responsible for updating the data? Role
- Can staff/students search database/tool? YES /NO
- If YES, Do they:
 - Use keywords
 - Have varying levels of access
 - Other- describe

17. Would you have an interest in using mapping database/tool for curriculum/staff/students in future? **YES/NO**

17a) Can you describe any Barriers?

.....

17b) Can you think of any Enablers?

.....

(* If NO to Q17 go to Q19)

18. What do you consider to be the ideal properties of such a tool?

- a) Searchable database- keyword search
- b) Real time/live data
- c) User friendly interface
- d) Web based interface
- e) Secured database
- f) Linkage/prefill qualities= unit outlines/other docs
- g) Accessible to staff (+/- various levels of access)
- h) Accessible to students (+/- various levels of access)
- i) Reporting functionality eg. progress against standards
- j) Other
- k) Unsure

19. Would you be happy to disseminate a survey link via email to you staff & students **OR preceptors & interns** regarding their use, knowledge and acceptance of the CS and other pharmacy education outcomes? YES/NO

Confirm email address:

Appendix 3. Papers 4, 5, 6; Traffic Light Report educational intervention

3.1 Self-assessment tool (including ethics form, self-assessment tool and confidence test)

UTAS Pilot: Educational Outcomes Project
(GPA, self- assessment & CS reporting based on actual assessment)
Consent sheet

School of Pharmacy, UTAS: “Use, Knowledge and Acceptance of Australian Competency Standards Framework for Pharmacists and other Pharmacy Education Outcomes in Australian pharmacy education”. By signing this consent form I am agreeing to participate in the above project being undertaken by researchers at the University of Tasmania (UTAS).

1. I have read and understood the Information Sheet for this project.
2. The nature and possible effects of the study have been explained to me.
3. I understand that the study involves me allowing the research staff to access my Gross Point Average (GPA) score +/- my academic results from the school of pharmacy UTAS.
4. I understand that my GPA score & academic results will be in a re-identifiable format. I acknowledge this is necessary for the researcher to analyse my GPA score in relation to my participation/non-participation in the pharmacy outcomes intervention project in 2014.
5. I further understand that all research data will be securely stored on the University of Tasmania premises for five years, and will then be destroyed.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered from me for the study may be published, provided that I cannot be identified as a participant.
8. I understand that the researchers will maintain my identity confidential and that any information I supply to the researcher(s) will be used only for the purposes of the research.
9. I agree to participate in this investigation and understand that I may withdraw at any time without any effect and, if I so wish, may request that any data I have supplied to date be withdrawn from the research.

Iacknowledge the above information and wish to provide the researcher with;

Activity Description	Yes	No	Signature
Access to my GPA Scores			
My completed self- assessment tool (End: Semester 1 & Semester 2)			
Access to my academic results for 2014			

B.Pharm student email address:

Statement by Investigator: I have explained the project & the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation

Name of Investigator: _____

Signature of Investigator: _____ **Date:** _____

Section 2. Mapping Tool/Reporting Intervention Use & Acceptance

Electronic CS Self- Assessment Tool

Student ID:

Year of Study: 1/2/3/4

Domain	Knows	Knows How	Shows	Does	Student Comments (eg assessment, evidences)	Assessed	Needs Attention		
							Green	Orange	Red
Domain 1. Professional & Ethical practice									
1.1 Practice legally									
1.2 Practise to accepted standards									
1.3 Deliver 'patient-centred' care									
1.4 Manage quality and safety									
1.5 Maintain and extend professional competence									
Domain 2. Communication, Collaboration & Self Management									
2.1 Communicate effectively									
2.2 Work to resolve problems									
2.3 Collaborate with members of the health care team									
2.4 Manage conflict									
2.5 Commitment to work and the workplace									
2.6 Plan and manage professional contribution									
2.7 Supervise personnel									
Domain 3 Leadership & Management									
3.1 Provide leadership and organisational planning									
3.2 Manage and develop personnel									
3.3 Manage pharmacy infrastructure and resources									
3.4 Manage quality service delivery									
3.5 Provide a safe and secure work environment									

Domain 4 Review & Supply prescribed Medicines									
4.1 Undertake initial prescription assessment									
4.2 Consider the appropriateness of prescribed medicines									
4.3 Dispense prescribed medicines									
Domain 5 Prepare pharmaceutical products									
5.1 Consider product requirements									
5.2 Prepare non-sterile drug products									
5.3 Aseptically prepare sterile drug products									
5.4 Prepare cytotoxic drug products									
Domain 6 Deliver primary & preventative health care									
6.1 Assess primary health care needs									
6.2 Deliver primary health care									
6.3 Contribute to public and preventive health									
Domain 7 Promote & Contribute to optimal use of medicines									
7.1 Contribute to therapeutic decision-making									
7.2 Provide ongoing medication management									
7.3 Influence patterns of medicine use									
Domain 8 Critical analysis, research and education									
8.1 Retrieve, analyse and synthesise information									
8.2 Engage in health, medicines or pharmacy practice research									
8.3 Formally educate and train students and healthcare colleagues									

Instructions: Please be as honest as possible when completing this document. This is your own assessment of your progress towards the CS and is intended to highlight areas that may require your focus/future attention. Needs Attention: Traffic light Urgent (Red), Needs non-urgent attention (Orange) Okay (Green)

Adapted with permission (Stupans et al., 2012) (Jones, Yates, & Kelder, 2011)

Please include your email address.....You will receive a CS report based on your assessments at the end of Semester.

Confidence Testing

	Question	Not prepared	Not well prepared	Adequately prepared	Well prepared
1.1.1.1	Understands the requirements of state law, professional guidelines, codes and standards that comprise the legislative environment for practice.				
1.3.1.2	Respects the rights of consumers to participate in decision-making, control their personal information and make choices about their health care.				
1.5.1.1	Understands the concept of life-long learning for pharmacists.				
2.1.1.4	Recognises barriers to effective communication must be addressed.				
2.1.3.1	Establishes rapport and empathy with the consumer				
4.1.2.2	Liaises with the prescriber and/or the consumer/carer to obtain additional information as required.				
4.2.1.1	Uses a systematic approach to access and review the consumer medication record or notes.				
4.2.2.3	Identifies clinically significant potential or actual drug related problems likely to be associated with use of the prescribed medicines.				
4.3.1.6	Ensures dispensed medicines are issued and the applied labels directly correlate to the prescribed medicines and dosing regimen.				
5.1.3.3	Uses reference sources to modify the formulation in a manner consistent with consumer needs, and professional guidelines and conventions.				
6.1.1.1	Undertakes consultation with the consumer/carer in a manner that protects their privacy and confidentiality.				
7.2.3.3	Recommends therapeutic drug monitoring (TDM) where indicated.				
8.1.3.1	Understands basic concepts and terminologies required to critically analyse clinical information (literature).				

3.2 TLR participant feedback survey questions

Demographics

1. Age:
2. Sex M/F
3. Prior Study/Other Qualifications
4. Year of Study 1st/2nd/3rd/4th

Survey

5. Do you think the Competency Standards (CS) are relevant to you now?
YES/NO/UNSURE
 - a. If YES. Why?
 - b. If NO. Why Not?
6. Do you think the CS will be relevant to you in the future? YES/NO/UNSURE
 - a. If YES. Why?
 - b. If NO. Why Not?
7. Did you receive an email invitation to complete a CS self-assessment tool?
YES/NO/UNSURE
8. Did you complete the CS Self -Assessment tool? YES/NO/UNSURE
 - a. If NO. Why Not? (END OF SURVEY)
 - b. If YES. Why?
9. Did you receive your CS report based on your unit assessment? YES/NO/UNSURE
10. Did you refer to it? YES/NO/UNSURE
11. Did you compare the results from your CS Self- Assessment and the report based on your unit assessments? YES/NO/UNSURE
 - a. If YES. Did the results surprise you?
 - b. If NO. Why not?
12. Do you think the CS Self-Assessment tool is user friendly? YES/NO/UNSURE
 - a. If YES. Why?
 - b. If NO. Why Not?
13. Do you think the CS report based on your unit assessment was useful?
YES/NO/UNSURE
 - a. If YES. Why?
 - b. If NO. Why Not?
14. Do you think the CS Self- Assessment tool has changed the way you approach your learning compared to not having access to such a tool previously? YES/NO/UNSURE
 - a. If YES. How?
 - b. If NO. Why?
15. Do you think the CS report based on your unit assessments has changed the way you approach your learning compared to not having access to such a tool?
YES/NO/UNSURE
 - a. If YES. How?
 - b. If NO. Why?
16. Do you have any other suggestions or comments?

If you would like the results from this survey please email Rose Nash on Rose.McShane@utas.edu.au or call on (03)62296531

Appendix 4. Traffic Light Report

UTAS Students Competency Standards Report

Suggestions;

1. Review the report. Compare your Self-Assessment with your Actual report. Are there any surprises?
2. For each Domain consider which unit and which assessment item exposed you to the various CS? Are there any surprises here?
3. If you did not perform as well in your "Actual" results. Look back at the assessment listed in these reports how did you go in them?
4. Save this report to your e-Portfolio for safe keeping and enter a reflection (green reflection bubble) based on points 1-3 above.

Please take a moment to read this in order to optimise your learning from this report. This report is divided into 2 sections based on your;

1. Competency Standards (CS) Continuum based on Actual Assessment Results

The Actual Assessment results were determined using two stages.

Stage 1. Mapping for all assessment was carried out by 2 independent reviewers (JT, RN) and after two rounds of review consensus was met on which CS associated with each assessment item. Performance level on Millers (*Knows, Knows how, Shows, Does*).

Examples: Knows: Basic knowledge, recall (MCQ), Knows How: applied to cases, Shows How: simulated practice, Does: Actual performance in practice setting.

Stage 2. Results from your individual assessments (Fail=red, Pass=orange, Credit, Distinction, High Distinction= green) were stitched to the mapping in Stage 2. The highest attainment in each CS achieved based on the assessments you completed in Sem 1, 2014 are displayed.

The report also highlights which units & assessment items have contributed to your development of each CS and Domain.

2. Competency Standards Continuum based on Self- Assessment

The self-assessment you completed via limewire populates the left hand side of the report. Here you stated for each CS what level of attainment (millers) and at what level you felt you are currently performing at.

In some cases you may have also recorded where in your B.Pharm you have been assessed on the various CS.

NB:

1. This report is a cumulative report based only on your results for Sem 1, 2014.
2. Any CS from within the 8 Domains that you have not been exposed to in this Semester will not appear on your report.
3. This report does not contribute to your marks or assessment in the B.Pharm it is intended to summarise your results and help you to see your progress towards your Profession's CS.
4. If you attain a green in the Competency at a Does level this does not imply you are competent at entry level to the profession. It suggests you are tracking towards your target for your current level.
5. The reviewers have familiarity with the course but do not teach into all of the units. To ensure the mapping was "scaled" across the 4 years of the Bachelor course it was necessary to have two people mapping consistently for all units. Unit Co-ordinators were consulted in times of uncertainty.
6. If you have any concerns about the report please contact me. rmcshane@utas.edu.au Please note I cannot comment on individual assessment results.

165279	2	Student Name				
Domain	Standard		Assessed Millers	Assessed TrafficLight	Self-Assessed Millers	Self-Assessed TrafficLight
2	2.1	Communicate effectively	Shows how	green	Does	Green
4	4.1	Undertake initial prescription assessment	Knows how	green	Knows	Orange
	4.2	Consider the appropriateness of prescribed medicines	Shows how	green	Knows	Orange
	4.3	Dispense prescribed medicines	Shows how	green	Knows	Orange
5	5.1	Consider product requirements	Shows how	green	Knows	Orange
	5.3	Aseptically prepare sterile drug products	Knows	green	Knows	Red
6	6.1	Assess primary health care needs	Knows how	green	Does	Orange
	6.2	Deliver primary health care	Knows how	green	Does	Orange
7	7.2	Provide ongoing medication management	Knows	green	Knows	Red
	7.3	Influence patterns of medicine use	Knows	green	Does	Orange
8	8.1	Retrieve, analyse and synthesise information	Knows	green	Does	Green
	8.2	Engage in health, medicines or pharmacy practice research	Knows	green	Knows	Orange

165279	2	Student Name			
Domain	Where is it assessed (actual)			Student Self Assessment	
				Is it assessed?	Where?
2	2.1	CSA255	June Dispensing Practical Exam	Yes	I demonstrate effective communication at my workplace by focusing on the patient needs and speaking clearly and actively listening to them. I haven't been in a position to supervise personnel and am not sure if I have planned professional contribution
4	4.1	CSA255	June Dispensing Practical Exam	No	
	4.2	CSA255	June Dispensing Practical Exam	No	
	4.3	CSA255	June Dispensing Practical Exam	No	
5	5.1	CSA255	June Dispensing Practical Exam	Yes	At my workplace I have made up creams for patients and made up powdered suspensions. I don't know what was meant by by considering product requirements.
	5.3	CSA225	Final exam: Written examination 2 hours	Yes	At my workplace I have made up creams for patients and made up powdered suspensions. I don't know what was meant by by considering product requirements.
6	6.1	CSA255	June Dispensing Practical Exam	Yes	If primary health care means giving the best patient-centred care then I feel like I give that in the work place and we have gone over that last semester. I haven't had a chance to contribute to preventative health as a I am student not pharmacist - but I
	6.2	CSA230	Final exam	Yes	If primary health care means giving the best patient-centred care then I feel like I give that in the work place and we have gone over that last semester. I haven't had a chance to contribute to preventative health as a I am student not pharmacist - but I
7	7.2	CSA230	Mid-semester test	Yes	In the workplace I try to give the best advice for each patient on their choice of S2/S3 medication and I think I have influenced patterns of medicine use when I remind people how to take their medicine and they learn something new and take their medication

165279	2	Student Name			
	7.3	CSA225	Final exam: Written examination 2 hours	Yes	In the workplace I try to give the best advice for each patient on their choice of S2/S3 medication and I think I have influenced patterns of medicine use when I remind people how to take their medicine and they learn something new and take their medication
8	8.1	CSA255	Module Assessments (MyLO quizzes)	Yes	In evidence based healthcare in semester to we look at how to critically analyse research but we also learnt how to in Human Biology, I often research drugs or conditions in the workplace when a patient has a medication or disease I haven't heard of before
	8.2	CSA225	Final exam: Written examination 2 hours	Yes	In evidence based healthcare in semester to we look at how to critically analyse research but we also learnt how to in Human Biology, I often research drugs or conditions in the workplace when a patient has a medication or disease I haven't heard of before